Australian Personal Computer

INCLUDING PC Super Market

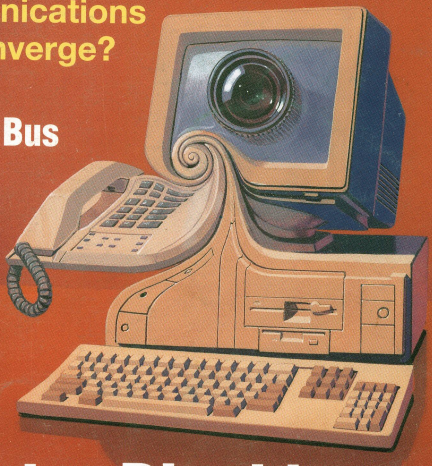
ISSN - 4115 NZ $8.75 INCL. GST

DECEMBER 1993 $6.20

AUSTRALIA'S TOP SELLING COMPUTER MAGAZINE

The Info Superhighway

Will Computers, Media and Communications Really Converge?



Inside the PCI Bus

Plus First Looks: We Test First PCI Bus Machine

OS/2 2.1: A User's Perspective

PER.
CD1.C404
OS
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4th ANNUAL REVIEWS

Printer Blockbuster

- New Laser Printers From $1200



DEL2962APC/1

SAVINGS A

THE MOST EXPANDABLE 486 ON THE MARKET TODAY



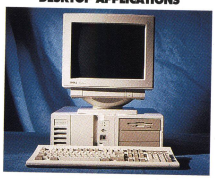
DELL OPTIPLEX 425s/LV i486 SX 25Mhz SYSTEM

$2,191 ($2,575 inc. tax)

FEATURES

- Upgradeable to all Intel i486 processors including Pentium Technology
- VESA option installed
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- 120Mb Hard Drive
- 3.5" or 5.25" Floppy Disk Drive
- Accelerated local BUS Video
- Super VGA 1024 Monitor (14", 1024 x 768, .28mm)
- 512Kb Video RAM (expandable to 1Mb)
- 3 Drive Bays
- 3 available ISA 16-Bit Expansion Slots **(which include 2 VESA slots)**
- 2 Serial (buffered), Parallel and Mouse port
- Embedded diagnostics
- MS-Dos 6.0/MS Windows 3.1/Mouse

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- 3.5" or 5.25" Floppy Disk Drive
- Accelerated local BUS Video
- Super VGA 1024 Monitor (14", 1024 x 768, .28mm)
- 512Kb Video RAM (expandable to 1Mb)
- **5 Drive Bays**
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The new Dell OptiPlex PCs are mission-critical machines, designed to perform tirelessly in the workplace on the most demanding business applications.

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- Super VGA 1024 Monitor (14," 1024 x 768, .28mm)
- 512Kb Video RAM (expandable to 1Mb)
- 3 Drive Bays
- 3 available ISA 16-Bit Expansion Slots
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FEATURES

- Upgradeable to all Intel i486 processors
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- 120Mb Hard Drive
- 3.5" or 5.25" Floppy Disk Drive
- Local BUS Video
- Super VGA 1024 Monitor (14," 1024 x 768, .28mm)
- 512Kb Video RAM (expandable to 1Mb)
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- 1 Serial, 1 Parallel and 1 Mouse port
- Low profile chassis
- Optional 2.88Mb 3.5" Floppy Drive
- MS-Dos 6.0/MS Windows 3.1/Mouse

DESIGNED TO SAVE YOU MONEY. It's really quite simple. Dell NetPlex is designed as our entry level 486, for price sensitive buyers, who are looking for ease of use, and pre-installed off-the-shelf software. If you're looking for a reliable low cost certified network node, a PC for your small business or home office, or in fact if this is your first PC, NetPlex is for you.

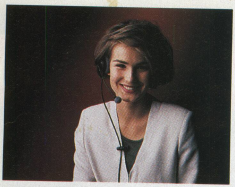
These are high performance machines that have also been specifically designed to be cost-efficient network nodes. Speed is provided by the local bus video performance. Space is saved by the chassis and keyboard design. Set-up and maintenance is kept to a minimum.

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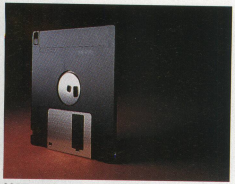
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DEL2962APC/2

IT'S AMAZING WHAT AN EVERYDAY



The four pass printing system was used to produce this high quality TIFF and DTP output on coated paper in under four minutes.

B&W PRINTER CAN DO THESE DAYS

THE PERSONAL COLOUR SQUIRT

If you had to choose one printer for your entire office, this would be it. Because the new Personal Colour Squirt™ BJC 600 from Canon is actually like two printers in one.

BRILLIANT BLACKS AT LASER LIKE SPEED

With a new high speed engine, bi-directional printing and "logic seeking" to skip blank spaces on the page, the Personal Colour Squirt can print a two page letter almost as fast as a personal laser printer!

Print modes include High Speed (180dpi), High Quality (360dpi) and Extra Black. The High Speed mode is arguably better than high quality on a dot matrix. The Extra Black mode is similar to Super High Quality on our BJ 200 series. When the latter was tested in a major U.S. survey, more than half the respondents couldn't tell the difference from laser output.

4-COLOUR PRINTING FOR PLAIN PAPER

But, our new colour Bubble Jet™ printer also offers high speed, four colour process printing optimised for plain paper at 360dpi resolution. Which means it makes everyday office use of colour output an affordable reality. The "driver" is uniquely designed for plain paper, and the inks dry 100 times faster than conventional inks. So you get brilliant output without bleeding and banding.

There are four separate ink cartridges feeding a print head for each colour. So, unlike ordinary inkjets using a 3-colour cartridge system, you don't need to throw away valuable ink just because one colour has run out. This means the cost per page will be considerably less than for colour inkjets.

What's more, because the BJC 600 uses plain paper and has far lower consumable costs, output will be a fraction of the cost of thermal printers.

PLUG IN AND PRINT, OR HIGHLY ADVANCED

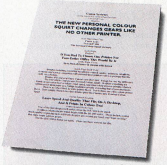
There are simple default settings, an easily understood control panel, on-line help, and even a manual on how to make the best use of colour. Drivers are available for both MS-DOS® and Windows.™

Canon also has choices for advanced users. The BJC 600 prints on coated (clay backed) papers, overhead transparencies and even back print film as well as plain paper. You can also adjust for grey-scales, screen to colour matching and preferred dither patterns.

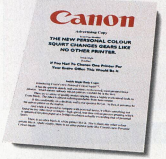
If all this doesn't convince you that this new Bubble Jet is by far your best bet, here's one more point.

The RRP, including sales tax, is just $1695.

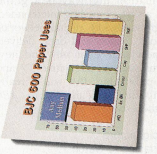
For more information call us 008 021 167.



The high speed, economical draft mode has an extremely low cost per page.



Extra Black and spot colour are ideal for recycled or weaved letterhead papers.



The Colour Personal Squirt is an ideal choice for producing colour presentations on overhead transparencies.



This complex colour bit mapped image was produced without banding on back print film.

Canon

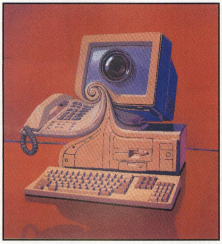
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CS2015/MSV&P

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DECEMBER 1993

Cover illustration by Ian McKellar
Cover concept by Intel Corporation



COVER STORY

The information superhighway.....58

The information highway is a grand scheme — a vast, sprawling interconnection of high-bandwidth digital networks, carrying voice, video and data, delivering the knowledge economy and new media forms such as interactive TV and electronic publishing. But will it really happen? In this special report, *APC* examines the issues.

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WIN A TOSHIBA COLOUR NOTEBOOK

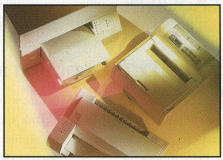
Hurry, get your completed readership surveys in the post now to be entered in the competition to win a Toshiba T1950C, 486DX2 colour notebook.

If you don't have a copy of the readership questionnaire (loosely inserted with the November issue) then ring Helen Summers on (02) 288 9123 and she'll send you one.

The notebook features a 40MHz processor and PCMCIA capabilities and has been designed to meet mobile computing demands of the future. Make sure you have your say in APC editorial policy and give yourself a chance to win the notebook worth over $6000.

FEATURES

4th Annual printer review.....114



The $1200 laser printer is reality. High-quality colour doesn't have to be expensive. Output is improving, especially among the low-cost inkjet printers. Footprints are shrinking, even as powerful new features are added. These are just a few of the developments we noted when testing laser, inkjet, dot matrix, and high-end colour printers. In this issue, Part I of our Annual Printer Reviews, we examine the current printer marketplace and review mainstream laser printers and portable printers. Part II, in our January issue, continues with reviews of shared lasers, inkjet, dot matrix and colour printers.

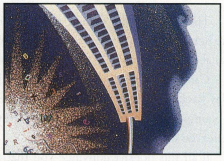
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172 Canon BJC-600
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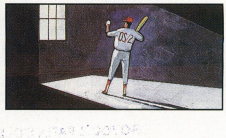
The PCI bus has arrived.....179



PCI technology, with the potential to break the PC data logjam, may redefine the PC bus. Superior performance, user friendliness, and a path for future upgrades make the PCI bus the bus of tomorrow.

180 History of the PC expansion bus
182 VL-Bus 2.0 and future prospects
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OS/2 2.1: A user's perspective...187



For a few minutes, let's forget the politics, the personalities, and the seemingly interminable corporate bickering associated with The Great Windows versus OS/2 Controversy. Are you feeling cramped by DOS/Windows? Give OS/2 a try.

FIRST LOOKS

AuStar EFX 4DX2-66P Pro series 33

The first of the new PCI generation offers excellent Windows video performance, but could be really boosted by replacing the ISA-based IDE drive controller with a PCI controller, or replacing it altogether with a SCSI-based configuration.

IBM's ThinkPad 750C 34

Get in early to take advantage of this efficient new notebook from IBM.

VoiceAssist 36

VoiceAssist voice training and recognition software for Windows that adds and executes spoken commands, and works with amazing accuracy.

Canvas for Windows 3.5 38

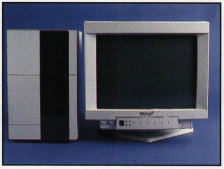
A wonderfully versatile drawing program new from the Mac world with the unique ability to edit bitmapped pictures from within a vector drawing. Canvas is strong on technical drawing functions such as dimensioning lines, drawing constraints and macro objects.

ScanMan EasyTouch 40

A next-generation parallel port greyscale scanner that's easy to setup and use. However, not designed for heavy production or tight deadline use, it also requires a steady, patient hand.

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Guide to buying direct: Part 4 40



In Part 4 of this series, PC Super Market looks at protecting your investment. We investigate warranties, maintenance and insurance.

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If you're thinking small, you've come to the right advertisement.



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With Renard, you can choose from a complete range of small wonders – Notebooks, Sub Notebooks and Palmtops packed with 486 power, versatility, and with the brilliance of colour.

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SUBSCRIPTION ENQUIRIES	Local call (02) 260 0091 Elsewhere in Australia 008 25 2515

PUBLISHING

PUBLISHER	Richard Walsh
DEPUTY PUBLISHER	Nick Chan

Standard subscription rate: Australia $70.00 per annum.
Distributed by Network Distribution Company, 54 Park Street, Sydney, 2000.
Telephone: (02) 282 8777

Australian Personal Computer Magazine is published by ACP Computer Publications, a division of ACP Publishing Pty Limited (ACN 053 273 546)
Sydney Office: Level 6, 54 Park Street, Sydney, 2000.
Telephone: (02) 288 9111; fax (02) 267 4903; telex AA 20514 CONPRESS.
Melbourne Office: 102 Toorak Road, South Yarra, 3141.
Telephone: (03) 823 6333; fax (03) 823 6363.
Printed by Hannanprint Pty Ltd.

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APC wishes to thank Sharp Australia for the provision of testing equipment including 2 PC-7700 Notebooks. Sharp equipment is used for APC inhouse testing.

New RISC chips for Windows NT

Windows NT is sparking some hot competition among chip makers who want a piece of the growing market for high-performance desktop PCs and servers. Three new RISC microprocessors from DEC, Integrated Device Technology (IDT), and Toshiba America are challenging the early leads claimed by Intel's Pentium and the Mips R4400. All three new chips are sampling now and are scheduled for volume production early next year.

DEC's entry is the AXP 21066, the lowest-cost member of the Alpha AXP family. The 21066 sets a new standard for integration: it's the first microprocessor to include support for PCI (Peripheral Component Interconnect). It also integrates a memory controller and a graphics accelerator.

CPUs FOR WINDOWS NT

	DEC AXP 21066	ORION R4600	MIPS R4400PC	PENTIUM 66	POWERPC 601
Clock speed	166MHz	100/50MHz	150/75MHz	66MHz	66MHz
SPECint92	70	68**	N/A	67.4	60
SPECfp92	105	60**	N/A	63.6	80
Transistors	1.7 million	1.8 million	2.3 million	3.1 million	2.8 million
L1 cache	16K	32K	32K	16K	32K
Process	0.68-micron CMOS	0.64micron CMOS	0.6-micron CMOS	0.8-micron BiCMOS	0.65-micron CMOS
Die size	209 square mm	76.5 square mm	157.5 square mm	294 square mm	120 square mm
Price*	424	288*	500*	926	464.5

* price in quantity of 1000; ** approximate; N/A — information not available

IDT and Toshiba are introducing separate versions of the new Orion R4600, developed in a joint venture with Quantum Effects Designs in the US. The Orion is a Mips R4400-

News roundup

The computer industry is now like the Australian economy on an upswing. As the results for the October quarter rolled in, it became clear that across the board profits were up. Even IBM chipped in with a smaller than expected loss.

What was perhaps most interesting was the increase in volumes. While profits were generally up a few percentage points in even the most successful computer companies, volumes were up dramatically. In some cases volumes had increased 100 per cent while profits had only gone up 10 per cent.

In the PC business, this reflects the dramatic price drops we have seen in both hardware and software over the last couple of years. Companies are still adjusting to this and are getting their costs down. The costs of these adjustments are still flowing through and it will be another couple of quarters before we see profits really surge.

Of course, one way that software companies have reduced prices by the 'back door' is through software suites. By bundling together a range of applications and selling them at a considerable discount to the combined price of all the applications, software vendors can keep prices down without significantly adjusting the price of individual applications, thus keeping up an unreal image of the cost of their applications.

Microsoft is one company that has done very well with its Office suite. Last month the company announced a new version, Microsoft Office 4. This in-

Comdex report

After years of battling against IBM-compatible computers, at this week's Comdex Fall 93 Apple finally announced its own Macintosh with DOS and Windows capabilities.

At the keynote address, Apple CEO Michael Spindler announced the Macintosh Quadra 610, DOS-compatible version. The system's dual processors (25MHz 68LC040 and 25MHz Intel 486SX) will allow users to run Macintosh and DOS or Windows at the same time.

Apple's new Quadra 610, is loaded with both Motorola 68LC040 and an Intel486SX microprocessor.

"We don't want compatibility issues for our customers," said Ian Diery, executive vice president of Apple's Personal Computer Division. "By developing its most compatible personal computer, Apple intends to provide its users with all of the advantages of the Macintosh platform while protecting their investment in DOS and Windows-based software," he said.

The system will provide dual monitor support so that users have the option of viewing the Macintosh and DOS environments at the same time. Users can add an additional monitor without having to purchase an additional video card. The DOS-compatible Mac will be priced at $US500 more than the Quadra 610, which starts at $US1200.

The Newton gained more than new accessories this week: AST, IBM and Sharp have introduced PDAs. The new PDAs range from one to 2.4 pounds, and all except IBM's Simon include infra-red.

AST's Model 2390 and Sharp's PT-9000 will be available in the first quarter of 1994, and Simon will begin shipping in December of this year.

The Simon from IBM and Bell South is shaped like a cellular telephone and fittingly it features this function. Simon is touted as "the first personal communicator that packs all your mobile business tools", it offers cellular pager, calendar, calculator, fax, email, address book, and handwriting and keyboard functions. Infrared connectivity is not available, but IBM said it was looking into it. Simon is priced at $US850, and will be shipped in the US in December of this year.

The AST Model 2390 will be shipped in the first

Continued on page 8



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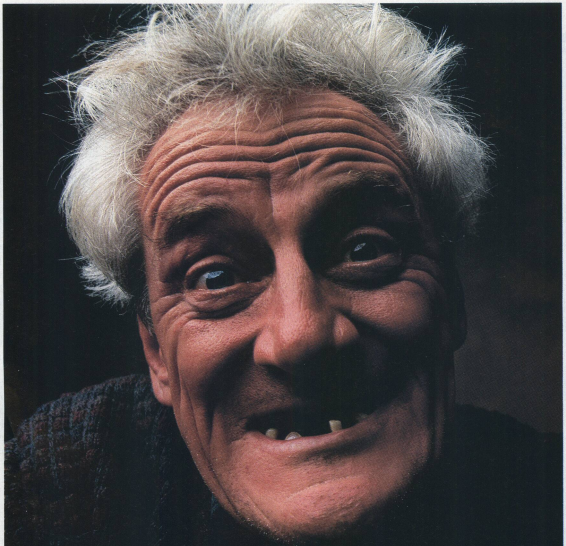
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PC MAGAZINE EDITORS' CHOICE Sept. 14, 1993

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News roundup

From page 7

cludes the newly released Word for Windows 6 and also promissory notes for free upgrades to the latest versions of Excel for Windows and PowerPoint for Windows, when they become available.

One of my favourite things about Microsoft Office 4 is the little icon bar called Microsoft Office Manager. It provides a simple way to launch applications or to swap between them.

Microsoft also caught up with some of the problems that had been caused by MS-DOS 6.0. MS-DOS 6.2 has some clever features to get around the problems caused by the disk compression software and disk caching software in Version 6.0.

Meanwhile, on the technology front, Intel unveiled its next-generation Flash products, Hayes announced that it was seeking certification for a new modem standard that will push transmission speed up to 230.4 kilobits per second. On the other side of the world, Hitachi has succeeded in getting its single electron memory system to work at room temperature. This breakthrough holds out the promise that we will have memory systems that are 10 million times denser than current memory chips. In other words, within the next 20 years we could be installing 10-million megabit chips in the same spaces that we now fit one-megabit chips.

In the conventional hard area, Compaq replaced its premium line of Deskpro/i desktops with a new Deskpro XE range. NEC also released a new range and Toshiba finally managed to get its laptops down below the $3000 mark. Apple restructured its desktop range slightly and added a couple of new models in the notebook area.

DEC staged the biggest single roll-out of products in the company's history. The company billed this as a significant contribution to client/server computing.

Jeremy Horey

compatible CPU that is claimed to be faster than Mips' own R4400PC. IDT is producing a 5V version while Toshiba makes a 3.3V part. IDT says it will introduce a 3.3V version in 1994. All these chips share a common design philosophy: by departing from existing architectures within their respective processor families, they slash costs while delivering Pentium-level or better performance.

DEC's 21066, shares the same superscalar architecture as the faster AXP 21064, but it's clocked at 166MHz instead of 200MHz. The data bus was scaled down from 128 bits to 64 bits, and the pin count was reduced from 431 to 287.

Yet despite these modifications, the level of integration was increased. The 21066 includes the equivalent of a complete processor-to-PCI chip set, except for a bridge chip to a secondary I/O bus. The bridge chip was omitted so that system designers can couple the 21066 to any secondary I/O bus such as ISA or EISA.

All this integration adds about 10 per cent more silicon area to the core logic of the 21066. The chip will move to a 0.5-micron process next May, shrinking the die almost 50 per cent. The Orion R4600 similarly diverges from its parent architecture while maintaining compatibility and reducing cost. Although it's pin compatible with the Mips R4400PC, the Orion has a five-stage pipeline and it substitutes a two- way set-associative cache for the R4400's direct-map primary cache. IDT says these modifications result in fewer stalls during instruction processing.

Another significant departure from the R4400PC is the Orion's fully static core and standby mode. A new wait instruction stops all internal clocks and dramatically cuts power usage. IDT says the 3.3-V Orion consumes about 2.3 W when running normally.

The Orion's die size, power dissipation and price are about half that of the R4400PC. Yet it's fully compatible with the R4400PC and has the same 64-bit data paths.

The first Orion will be clocked internally at 100MHz and externally at 50MHz (that is, 100/50). Next year, faster versions are expected to range from 120/40MHz to 133/66MHz, topping out at an estimated 84.5 SPECint92.

Other chip makers aren't standing still. In 1994, Intel plans to move the Pentium to a 0.65-micron process that should boost its performance while sharply reducing power consumption and manufacturing costs. IBM and Motorola hope to introduce their PowerPC 603, 604 and 620 chips by late 1994, and speedier versions of the Mips R4x00 series and DEC Alpha and anticipated. For more on the PowerPC developments, see our story in Newsprint's Systems section on Page 14.

Tom R Halfhill

quarter of 1994 and will retail for under $US1000. Through a PCMCIA type II card or external pocket modem, it offers the user access to online services such as email, a gateway to Internet, and wire services. It provides a serial port and a port that will support infrared communications.

While the price of the new Sharp PT-9000 PIA is not yet known, it will be available in the first quarter of 1994.The PT-9000 PIA can be used with an optional keyboard to bridge the gap between electronic organisers and notebook comptuers.

In addition to flat mates, the Newton has gained a fax modem card, a connection kit for Windows and email. The $US220 fax modem is a PCMCIA type II format card and will allow users access to NewtonMail and other online services. The Windows Connection Kit ($US165) enables users to exchange information between a Newton and Windows-based personal computers.

Multimedia

A US multimedia software company has caused an uproar by claiming to have invented multimedia. Compton's New Media announced it would start to enforce a patent it had received and begin issuing licences. Compton said it was granted a patent for "Multimedia search systems using a plurality of entry path means which indicate interrelatedness of information" The company said it wanted to be known as the creator of multimedia and will charge other multimedia companies to use the technology.

The patent was applied for in October 1989 following the release of the company's MultiMedia Encyclopedia which integrates pictures, sound, motion, and multiple entry paths. "We simply want the public to recognise Compton's New Media as the pioneer in this industry, to promote a standard that can be used by every developer and to be compensated for the investments we have made to make multimedia a reality for developers and end users.

On the product front, the company announced the new version of its Interactive Encyclopedia which features full-screen, full motion picture quality video using the MPEG standard for compression.

Compton's Interactive Encyclopedia Version-MPEG Edition, priced at $US395, can play images back at 30 frames per second using Sigma Design's ReelMagic MPEG decompression video board.

More than 40 companies at the show exhibited Pentium-based systems including Acer America, Advanced Integration Research, American Megatrends, Artek, Aten International, AST Research, CompuAdd Computer Corp, Digital Equipment Corp, Dell Compute oldStar Technology, Hewlett-Packard, IBM Corp, NCR Corp, Samsung Electronics, and Tatung.

Digital Equipment Corp showed its new DECpc XL series which offers users a choice of processors including i486, Pentium and Alpha AXP. For example, the DECpc XL 560 is Pentium-based and starts at $US2899.

Sun Microsystems showed its multimedia SPARCclassic M System starting at $US5295. The base system features 16M RAM, a 15inch colour monitor, 207M hard disk and multimedia capabilities including video capture and compression.

By Ann Steffora and Monica Snell in Las Vegas
Edittech International

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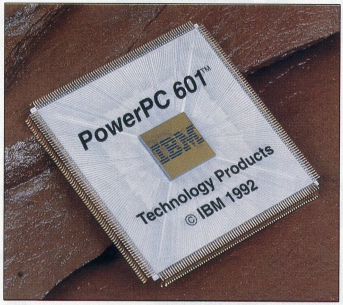
SYSTEMS

PowerPC chip moves in: will it replace your 486?

A decade after IBM and Apple established incompatible desktop computing standards, they signed a historic peace treaty in 1991. They agreed, along with Motorola, to jointly develop a RISC-based processor called PowerPC, on which future IBM and Apple machines would be based.

IBM recently shipped the first computer to use the PowerPC chip. PowerPC will consist of a family of chips beginning with the 601, which the alliance claims costs less, performs better, emits half the heat, and measures half the size of Intel's Pentium processor. More family members are expected in 1994: the 603 chip will be low-powered for use in notebooks and the 604 will be more powerful than the 601. PowerPC's first 64-bit processor, the muscular 620, should be available by the end of next year.

IBM's first PowerPC-based system, the Power-station/POWER-server 250, is not a Pentium killer but an addition to IBM's workstation line. This isn't surprising, since the roots of PowerPC's architecture are firmly planted in IBM's RISC technology. Like the workstations it replaces, the 250 runs a version of Unix and has a Micro Channel architecture (MCA) bus. The system competes with RISC-based Unix workstations from Digital Equipment Corporation, Hewlett-Packard, Silicon Graphics, and Sun Microsystems; it will run DOS and Windows applications in emulation. The first Pentium killers won't appear until another camp in IBM, the Power Personal Systems Division, ships its first 601 system in 1994. IBM had on show a preproduction unit at last month's Comdex show in Las Vegas.



Progeny of an unlikely marriage — the PowerPC chip

Apple plans to migrate its systems from Motorola 68000-series processors to the more powerful PowerPC from the first half of next year. Using emulation technology, Apple guarantees that today's applications will run on the new Macintoshes.

PowerPC systems will not appeal to the 486 and Pentium crowd until popular operating systems and business applications are available on the new machines. IBM plans to have a new version of OS/2 available for PowerPC in the distant future, and sources say that Motorola is working to port Microsoft Windows NT to PowerPC. Taligent's object-oriented operating system (code-named Pink), another part of the Apple and IBM truce, will run on PowerPC. For the time being, there are no predictions as to when the system will be available.

Christopher Barr

The eternal 386

New microprocessors with slick names like OverDrive, Pentium and Blue Lightning have eclipsed the power of the 386, but it looks like the 386 isn't destined to follow the 286 into obscurity. Instead, the 386 processor is finding a new life in what's known as *embedded systems* — home office appliances that have been fitted with processors.

Embedded systems get little or no attention simply because they use old chips, but tens of millions of processors are sold annually into the embedded systems market. Today you'll find processors in just about every modern convenience from cars to modems.

In the early 80s, the eight-bit Z-80 was the embedded CPU of choice; now the preferred chip is Intel's 80186 or Motorola's offerings. One of the reasons that Intel chips are preferred is the recent proliferation of 286 programming tools; the other reason is the widespread acceptance of Windows.

General Instruments and Intel have already announced plans to use a 386 in a cable-TV set-top decoder. In this case, the purpose of the 386 is to handle the user interface, which we expect will be some type of graphical menu that lets you scroll through program listings.

Later this year, 386 chips will be used in scanners, network cards, barcode readers, cellular phones and telephone switches. Evangelising its Microsoft-At-Work strategy, Microsoft is making deals that call for 386 chips copy and fax machines. It won't be too much longer before we see a 386 chip built into a microwave or toaster



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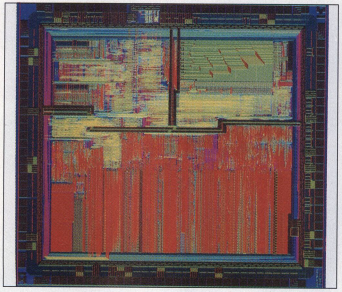
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Reincarnation for the 386

oven. We'll probably dub that Microsoft-At-Lunch.
Christopher Barr

Colourful future for pen systems

Brilliant active-matrix LCDs have been showing up on notebooks for nearly two years, yet active-matrix pen systems have yet to be introduced. New digitiser technology from Kurta, MicroTouch and Scriptel will make pen systems just as colourful as their notebook cousins.

A digitiser translates analogue pen strokes, motions and scribbles into digital 1s and 0s. Although there are many digitising methods, digitisers that use untethered pens are probably the most popular. Both electrostatic resistive and electromagnetic digitisers use electrical impulses to detect the pen's position.

Pen computers with active-matrix colour panels have not been available because active-matrix colour LCD panels, which have more than 900,000 transistors embedded into the display, generate electrical 'noise' that interferes with the digitisers. Monochrome panels don't create nearly as much interference. To be effective, digitisers must be accurate to within a half a pixel over the entire screen, including near the edge of the display. Kurta, MicroTouch and Scriptel, companies that currently make standalone digitisers for CAD/CAM and precision-graphics applications, have recently overcome the noise problems. While many colour pen systems based on the new digitisers are expected sometime next year, NEC will ship a pen upgrade to the colour Versa before the end of this year in the US, and early in the new year in Australia. Colour pen upgrades for mono screen Versas will be also available soon, according to Morann Paterson, NEC's product manager for portable systems in Australia.
Christopher Barr and Helen Dancer

Compaq expands range, reduces prices

Compaq is on a roll at the moment if this month's new product announcements are anything to go by. This time the company has added significantly to its range of desktop PCs, with the introduction of new models to the Deskpro, ProLinea Net and ProLinea MT families, and has also announced price reductions on existing models.

The Compaq Deskpro XE is available in 486 or Pentium models, and features local bus QVision graphics and Enhanced Business Audio. Compaq has set the price of a Pentium based Deskpro XE with a 60MHz processor and 270M hard drive at $7158.

ProLinea represents Compaq's direction for price competitiveness in the middle tiers of the market, a direction which managing director, Ian Penman, claims has been very successful. The new models in this family, the ProLinea Net and ProLinea MT represent all-in-one computing, an easy entry into networked computing, and a better price/performance ratio. The Net1/25 features a built-in monitor and a pre-installed Ethernet or Token Ring NIC on the system board. The Net is available as a 486SX/25, which is upgradable to 486DX/33, 486DX2/50 or 486DX2/66 processors.

The ProLinea MT is a five-slot mintower and is distinguished by its expansibility. The machine is upgradable to Pentium technology. Prices have been cut across the existing ProLinea range, with a six to eight per cent reduction on the cost of a ProLinea 4/33s, 14 per cent off the ProLinea 4/50 and 12 per cent off the ProLinea 4/66s. Similarly, prices of the Deskpro 5/60M have been cut, by up to 25 per cent.

The new competitiveness has not hurt the company's results; Compaq in the US reported a record rise in earnings for the third quarter, a rise of 64 per cent over the same period last year.

Chasing US government contracts, Compaq, like many other PC manufacturers, has made steadfast efforts to comply with the EPA standards for emissions in both manufacture and use of PCs. Energy-saving features in the PCs, the elimination of CFCs in the manufacturing process, and conscious programmes for redesign and recycling have won the company commendations from the EPA. Compaq was also recently awarded the 1993 Stratospheric Ozone Protection Award.
Helen Dancer



The new Compaq motif is power and affordability

New PowerExec notebooks from AST

AST Research has added to the family of PowerExec notebooks with a new processor based on the Intel 33MHz 486SL. The new processor boosts performance over the previous model's 25MHz processor by as much as 33 per cent, according to the company's lab testing.

The new PowerExec 4/33SL is available in TFT ColorPlus and monochrome models. Each are configured as 4M RAM (expandable to 32M), 200M hard drive, 1.44M floppy drive, and with a cable-free trackball, one Type III or two Type II PCMCIA cards. Both models are also equipped with AST's proprietary power management technology to conserve battery life.

The notebooks use nickel metal hydride batteries with an estimated run time of up to six hours, and concurrent recharge time of 90 minutes, or 60 minutes if the system is switched off. The new PowerExecs support 'hot swapping' — that is, the ability to change batteries during operation without losing data.

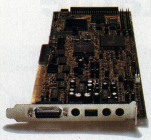
Optional extras include a docking station and quick connection to Easy Port. The monochrome PowerExec will carry a retail price of $6020, and the TFT ColorPlus costs $9250. For more information, contact AST Research on (02) 415 5400.
Helen Dancer

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Built into the card is an option to upgrade to support PCM Wave-Table Synthesis. Simply add the Sound Galaxy WavePower onto the 16-BIT Stereo Sound Card, your PC literally becomes a stunning musical instrument.

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16-BIT Stereo Sound Card that allows recording from multiple sources like Stereo FM, Stereo Microphone, Stereo Line-in, Stereo CD-Audio and Covox/Disney Sound Source voices. Sampling range from 4KHz to 44.1KHz, the NX PRO 16 is able to capture and playback sounds with high fidelity. Its dynamic filtering will auto-adjust the filtering level for optimal recording and playback for superb sound clarity.

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EASE OF INSTALLATION

End all your hassle of jumper settings. Configuration settings are through software, thus giving you greater convenience and user friendliness.

EXTRAS AT NO EXTRA COST

Besides being feature-rich and producing incredible sounds, Sound Galaxy packs in extras such as HSC Interactive software for multimedia authoring, WINDAT™ OLE for audio edit, Monologue text to speech synthesizer, Audio Station, CD-Player, Utilities and Windows 3.1 drivers.

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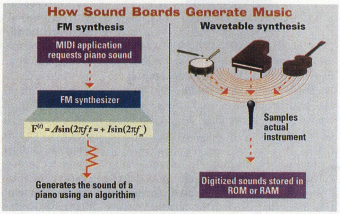
Catch a wavetable

Sound boards are sounding far more realistic than they used to, thanks to a technology called wavetable synthesis.

Most sound boards generate sounds using FM synthesis, a technology first pioneered in 1976. By using one sin wave operator to modify another, FM synthesis creates an artificial sound that mimics an instrument. Over the years, the technology has progressed (some FM synthesisers now use four operators) to a point where FM synthesis sounds good, but it still sounds artificial.

More realistic, inexpensive sound was pioneered by Ensoniq Corporation, the maker of professional keyboards, in 1984. Using a technology that had been theorised at about the same time as FM synthesis, Ensoniq found a way to sample any instrument, including pianos, violins, guitars, flutes, trumpets and drums, and to store the digitised sound in a wavetable. Stored either in ROM chips or on disk, the wavetable supplies an actual digitised sound of an instrument when called by the application. Soon after Ensoniq's discovery, other keyboard makers such as E-mu, Korg and Yamaha replaced their FM synthesisers with wavetable synthesis.

Albert Charpentier, Ensoniq's chief technical officer, believes all sound cards will use wavetable synthesis in the future. "The sound board business trails the professional music market by a few years. Professional musicians used FM synthesis in 1986, and wavetable synthesis with effects in 1989. Wavetable synthesis boards are finally replacing FM synthesis in the sound board market. No professional musician would settle for anything less," says Charpentier.



Although Yamaha virtually owned the chip market for FM synthesis, a number of professional keyboard makers with years of experience working with digitised sounds have wavetable chipsets that are beginning to appear in sound boards. Creative Labs' WaveBlaster uses E-mu's chip, and Media Vision's Pro Audio-Studio 16XL, due by the end of the year, will use Korg's. Yamaha's new OPL4 chip, due later this year, will be able to create both FM synthesis and wavetable synthesis sounds. Yamaha expects the boards to cost less than $US300.

Sound boards that offer wavetable synthesis using chipsets from other vendors include Diamond's SonicSound, Advanced Gravis's UltraSound, Orchid's SoundWave 32 and Turtle Beach's MultiSound.

Wavetable synthesis won't make every sound on your PC more realistic — only the MIDI sounds, which are often used in games. Windows .WAV files are actual stored sounds, and don't benefit from wavetable synthesis.

Chrístopher Barr

Wired Woodstock

The entertainment business has jumped on the multimedia bandwagon faster than most industries, bringing new computer technologies, digital cameras, software and video techniques to concerts and entertainment events. So while you may be struggling to bring multimedia software and hardware into the office, you may find that your kids are exposed to it long before you.

Take the WOMAD (World of Music, Arts and Dance) festival as an example. Founded over 10 years ago by musician Peter Gabriel to give exposure to international artists, it has become a beacon of high technology.

FutureZone, a high-tech mecca showcasing interactive displays from a number of computer companies including Apple and Sun Microsystems, was featured recently at the WOMAD festival held in San Francisco.

Inside FutureZone — located not far from the kiosks promoting GreenPeace and smart drinks — were a number of areas where the more than 100,000 festival goers could experience technology firsthand. Broderbund Software had a Kid•Cuts display where children used computers to create colourful masks to wear at the concert. A number of CD-ROM companies displayed their interactive titles, including a forthcoming interactive CD from Gabriel that combines art along with his music, and takes you backstage. Unlike an audio CD that plays only music, an interactive CD re-



Music and multimedia at San Francisco's WOMAD festival

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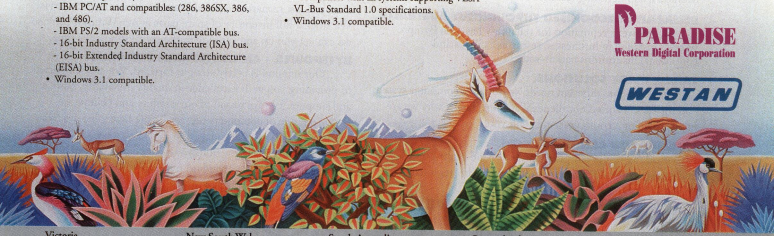
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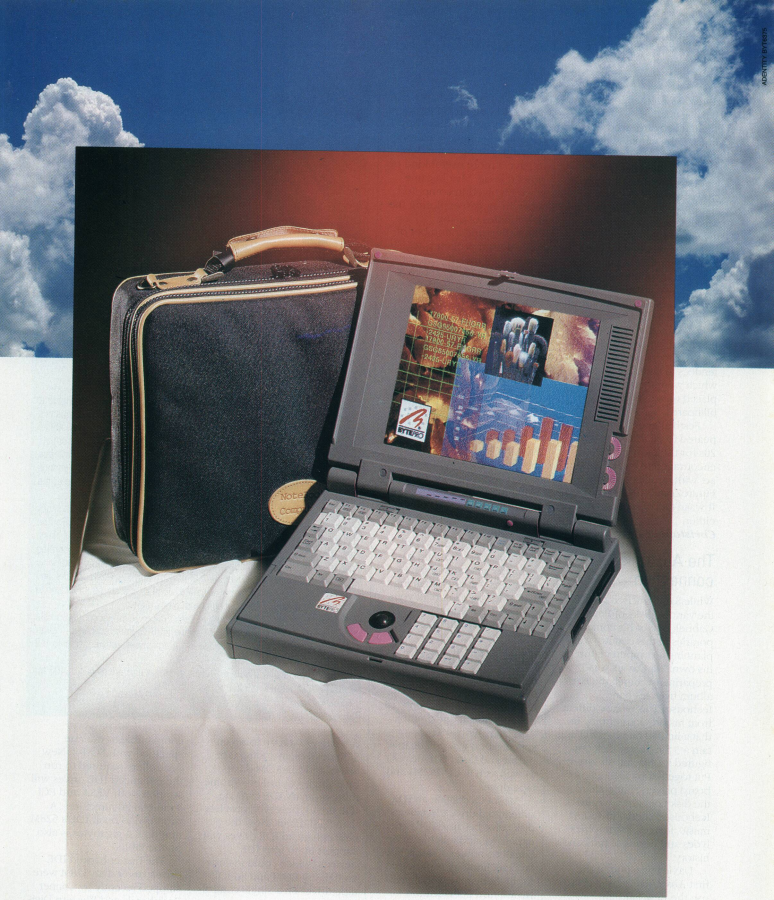
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quires a computer and mouse to navigate.

Brett Leonard, who directed the virtual-reality-inspired movie, *Lawnmower Man*, and a team of videographers circulated among the crowd and shot videos with Sharp Viewcams. The footage was then incorporated into realtime music videos. Concert goers were also invited to experiment with image-editing software and to lend some of their own artistic talents to Leonard's Blendo Video. And more than a dozen professional photographers equipped with the latest in digital cameras encouraged attendees to take self-portraits, which were then printed and placed onto a 'digital billboard'.

Festival goers, who appeared to be in their early 20s for the most part, were encouraged to explore, interact with, and experience FutureZone's high-tech tools. It wasn't a bad concert, either.

Christopher Barr

The Australian connection

While San Francisco displayed the various disks of Peter Gabriel, one of his contemporaries in this country was planning a computer coup of his own. Iva Davies was preparing to launch the latest album from his band, Icehouse. This release differs from his previous efforts, in that a limited number will contain a 3.5in floppy disk configured for Macintosh systems. Put together by Icehouse keyboard player, Simon Lloyd, the disk contains a wealth of Icehouse material including music, images, biographies, lyrics and details of the band's history.

Davies was one of the first Australian musicians to use the new Fairlight machine when it emerged in the early 80s, and has never been afraid of experimenting with new technology. But why a computer disk, and why now? "I don't know why we did it," admitted Iva, "It was mostly an instinctive thing, although I can look back on it now and see how it would be a good idea for journalists using computers to have a more useful kind of press release." Iva became more involved in computers when he began exploring the possibilities of using Photoshop and a number of other design programs to produce all the artwork for the album himself. The task demanded wider skills, so he roped in a friend; "I knew Simon (Lloyd), because he had played saxaphone in a number of British bands, although when I first met him he was working as a programmer for movie soundtracks, acting as the intermediary between the score-writer and synclavier."

Currently in the throes of setting up his own independent record company, Diva, Davies is more involved with the processes of sequencing, programming and sampling than ever before.

"Ultimately I want to tie this in with an audio-visual end, for video clips and so forth, because with the new programs that are becoming available you can do all your own online editing."

Natbaniel Tunbridge

Faster IDE drives

An unwritten law says that no matter what the size of your hard disk, you'll have only 10 per cent free at any time. What may help is a new specification that will enable bigger and faster IDE drives, as well as IDE CD-ROMs and tape drives.

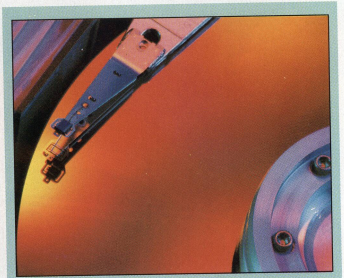
Most PCs contain an IDE (integrated drive electronics) disk drive because IDEs are inexpensive and reliable. SCSI (small computer systems interface) technology is preferred for higher-capacity systems. Now a new specification called enhanced IDE, or fast IDE, should boost IDE drives to SCSI capabilities.

SCSI drives are desirable because they can hold more data and have greater throughput than IDE drives. And you can daisy-chain up to seven SCSI devices, including tape drives and CD-ROM drives, on a single controller — something ordinary IDE can't do. IDE drives, however, cost less than SCSI drives. Now the new enhanced IDE drives will support up to four IDE devices (which could include an IDE CD-ROM and an IDE tape drive) on a single controller.

Enhanced IDE also boosts data transfer rates from an average of two to three megabytes per second to approximately nine to 13Mbps over a local bus, which is comparable to the rate specified with SCSI-2. New controllers required to run the enhanced IDE drives will support both VESA and PCI local-bus architectures. A proposal to push IDE's 528M limit to 8.4 gigabytes is also on the table.

The first enhanced IDE drives larger than 528M were shipped recently by Conner Peripherals and Western Digital. Enhanced IDE will be adopted by all the major disk drive makers, including IBM, Quantum, and Seagate as early as 1994.

Christopher Barr



Seagate gives notebooks new drive

Seagate, leading manufacturer of hard disk drives, has released two update models in its ST9550 range. The two models are additions to the company's 2.5in drive line, the ST9550AG, which has a formatted capacity of 455M and the ST9385AG which has a formatted capacity of 341M. The products have been designed to meet the increased demand for power and storage being generated by the rise in the colour notebook market, and the demands of the mobile user to do everything on the move that they would do at the desktop.

With this design imperative, the new models feature patented shock sensing technology which offers operating shock rating of up to 100Gs. The company claims this is the highest shock tolerance in the product's class, and a glass/ceramic canasite disc substrate material improves recording densities and increases capacity. The development of the new material is the result of a joint development between Corning Glass Works and Seagate Magnetics. The material, called MemCor, can be manufactured to thinner specifications without compromising rigidity.

The new drives offer an average seek time of 16 milliseconds, spindle speed of 3980rpm and a 120K adaptive multisegmented cache. Power management features have reduced idling power consumption to 0.9 watts.

The drives are available to OEMs, at single unit prices of $US495 for the ST9385AG and $US595 for the ST9550AG.

Helen Dancer

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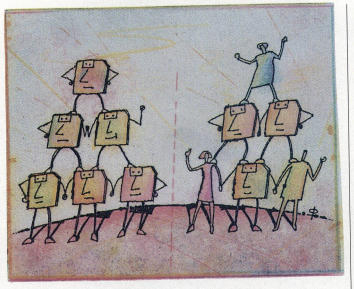
SOFTWARE

Vendors' new strategies take root

Workgroup computing has made it into the buzzword hall of fame, but is it a part of the operating system or an email component? A standalone application or some combination of these ingredients? At least there's agreement on this: a company's workgroup strategy must embrace multiple platforms and mobile users.

Watch for a new generation of workgroup-enabling tools that leverage existing apps. Lotus, which kicked off the workgroup era with Notes in 1989, has coined yet another buzzword — electronic keiretsu, a Japanese word for the extended organizational structure that drives Japanese business.

Lotus' Notes-centric environment is a soup-to-nuts solution. An often misunderstood cross-platform client/server app, Notes is based on a compound document with dial-up access and bidirectional replication, which enables remote users to synchronise data on their notebooks (email and Notes databases) with the Notes server via modem. Notes F/X, a data exchange feature, now lets you pump information from desktop apps into a Notes database. Upcoming components include a Notes development tool called Notebook and the LotusScript macro language. And a long-term project called Video Notes may bring low-cost video conferencing to the desktop in the near future.



Borland has recently adopted the Macintosh 'publish and subscribe' model with a middleware technology called Object Exchange, which builds communications services into existing Windows applications to create compound documents. Obex does not involve replication, version control, data formats, applications programming interfaces (APIs), or servers, just an RJ-11 phone jack. It ties together workgroups by transparently sending and updating documents over email systems and networks through the Workgroup Desktop.

Workgroup Desktop was introduced in Quattro Pro 5 for Windows and will appear in an interim release of WordPerfect 6. With the Workgroup Enabling Kit, power users and developers can retrofit existing Windows apps with Obex, without low-level programming of APIs.

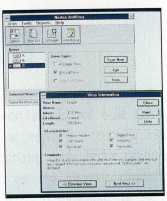
Not surprisingly, Microsoft's workgroup strategy is to embed workgroup services in the Windows platform and to provide an open foundation for application developers. According to Microsoft, a future version of Windows (code-named Cairo) expected in 1995 will use object-oriented technology that's data-centric rather than application-centric, so you'll be able to link and replicate data, charts, and documents throughout the workgroup. In the meantime, look for Microsoft apps to include delegation and routing features using Microsoft's messaging API (MAPI). Microsoft also plans to deliver group conferencing (or what it calls group memory) technology.

While the definition of workgroup computing may remain elusive, chances are you'll know it when you see it. Given the initiatives on the table, workgroup computing is quickly taking shape and is estimated to be a $US2 billion business by 1996.

Carol Levin

Norton's new terminator

NOVI may seem an unlikely name for a terminator, but then again, so is Arnold. NOVI is a highly efficient antivirus agent for computers and is the central plank of Symantec's new release, Norton AntiVirus 3.0. NOVI is a routine developed by software development house, Cetrus, bought by Symantec in 1992. It is unique in that it can detect and destroy viruses yet to be discovered. In other words, Norton AntiVirus 3.0 is not dependent on its inbuilt database of known viruses. Not that that would be an entirely bad thing, as the database is extensive. All of the 2000-or-so viruses discovered are in the database and monthly updates are available from Symantec. A nice feature for insomniacs is that the database includes a history of each virus along with a list of catastrophes it has



Norton AntiVirus 3.0's simple to use graphical user interface

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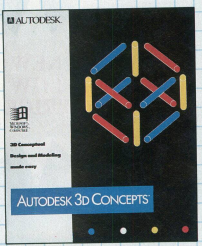
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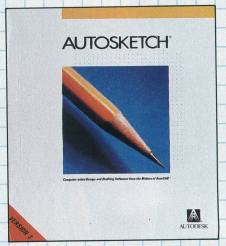
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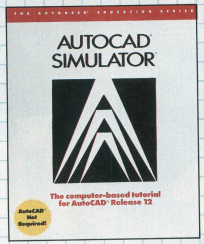
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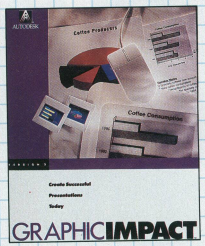
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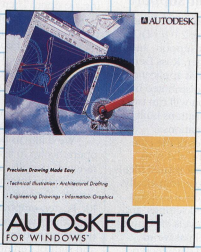


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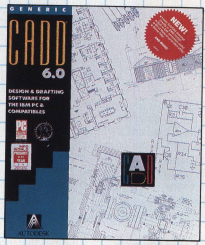


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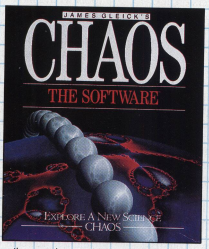
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Boring backup more attractive



Symantec Corporation has added several ease-of-use and automation features to its Norton Backup software to encourage users to perform regular backups.

The new version, called The Norton Backup for Windows 3.0, reads and restores backups created with DOS 6.0, which contains a subset of the Norton utility, and is customisable in all important aspects of backup including backup selection, backup types and a user-driven interface based on the level of expertise of individual users.

Backup media which can be used include tape drives, network drives hard disk, 2.88M floppy disk and SCSI-controlled devices. Version 3.0 also compares data to be backed up with its previous version, checks for defects and restores damage to files that are being backed up.

The Norton Backup for Windows 3.0 carries a RRP of $245, and upgrades from previous DOS or Windows versions are available for $49.

Helen Dancer

caused — a great late-night read. Added to this is Version 3.0's speed: it is four times faster than Version 2.1.

Norton AntiVirus for NetWare has also been released. It is an extension of the standalone product but is a NetWare Loadable Module (NLM). For a network manager the advantages are immediate. It offers far more power to enforce virus protection, leaving you less reliant on user discipline. It also protects the server and stops viruses spreading across a network. It is NetWare 3.1*x* and 4.*x* certified and identifies more than 2300 PC and all Macintosh viruses.

Chris Moriarty

INFO on tenders, online

A dial-up service offering information on tenders is now available from Tender INFO (Information Network Fully Online). The subscription-based service is designed for lodging tenders and for would-be contractors alike, according to the company's managing director, John Barnard. "The government likes it because it advertises their requirements to the largest possible service provider market, free of charge. Conversely, companies look for opportunities like it because it saves them time and money in searching."

Unlike similar services such as the tender service available on CompuServe, Barnard emphasises that the mechanism required to access Tender INFO forms part of every standard office — the telephone and PC.

"More than 50 per cent of small businesses now have a modem, and that proportion is rapidly increasing," he said. "Online access to information is the most cost-effective way for small businesses to keep in touch with their marketplace."

Searches can be automated, so that even fewer working hours are spent researching opportunities which match the company's skill set, and the service also automates the lengthy process of submitting a tender, reducing time spent by both tenderer and provider in applications, and application processing.

The service, which reaches across Australia and to New Zealand, costs $590 per annum, and browsers incur no online charges. Barnard calculates that the rate of new tenders averages 3000 per month, with successfully completed tenders being automatically deleted from the system.

For more information, or to subscribe, contact Tender INFO on (02) 746 1499.

Helen Dancer

Borland compiler offers 32-bit support

The newly released Borland dBASE Compiler 2.0 for DOS provides 32-bit support, and product manager, Ross Dembecki, claims that applications compiled and distributed by the new version will run twice as fast as applications built on previous incarnations.

New features of the compiler include the ability to compile and link related files to the main file automatically. The new version also stores commonly used settings, and offers higher levels of security with multilevel password protection and data encryption support from dBASE IV.

The new version also results in a smaller finished .EXE — up to 50 per cent smaller than could be written in Version 1.0.

The dBASE Compiler for DOS requires a 386 processor with at least 1M of extended RAM, although 4M or more is recommended.

RRP is $795, and existing users can upgrade from the previous version for $195.

Helen Dancer

MIRA an image for Australian Art

The latest news from IBM may come as a pleasant surprise to PC enthusiasts who, like me, wondered why there hasn't been more of an effort made to compile a genuinely helpful wide-ranging database for use by students and teachers. Mira may be the beginning of just that.

Mira is basicaly a database for storing high-resolution scanned images of the contents of libraries and art galleries.

Jointly developed by IBM and the US National Gallery of Art in Washington DC, the system was demonstrated recently in Australia by Ric Snyder, one of the key developers, who also explained how data was entered. Using 35mm film, a photograph is taken of the selected painting, and developed into an 8 by 10 transparency. This is scanned into Photoshop, where retouching and colour correcting are done. Then the image is put through a number of processes, including an 'optical jukebox', for compression. Images are created for a number of different formats. Working from an OS/2 platform, Mira magnified a 24-bit colour TIFF file several times without any loss of resolution integrity.

"We'd like to be able to open this up to a wider range of people, perhaps through the Internet," said Snyder. Technical developer, Ric Foster, emphasised, however, that the current application is for use by curators and staff of certain institutions, and that a new set of tools would have to be developed if and when a home market developed.

Archie Prioleau, from the Foundation for Education Innovation (FEI), a US-based organisation dedicated to pushing back the boundaries of learning constraints, spoke clearly and passionately on how the correct use of technology could revolutionise the education system. "The system works very well, but how about including sound or full-motion video?" he asked. He entertained no doubts about the importance of the project, calling it "the start of an infrastructure".

Mira also represents the composite result of three disparate aims; the US National Gallery of Art wanted an image data repository that would enable the NGA to become the focal point of world art; IBM wanted to develop and apply its digital technologies to solve customer problems; and FEI wanted to create better learning facilities for students. Mira has a lot of promise, but its success depends, not only on the capacity of LANs, WANs and yet-to-be-developed data highways, but also on the identity of the parent that will ultimately make the final decisions.

Nathaniel Tunbridge

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NETWORKING

Isochronous what?

As jargon goes, the word isochronous (emphasis on 'sock') sounds like a theory that physicist Stephen Hawking would write about. Instead, it's a new networking technology that may allow video conferencing across an Ethernet LAN — without bringing the network to its knees.

Isochronous Ethernet, or IsoEnet for short, is being promoted by National Semiconductor as an inexpensive alternative to more powerful networking standards due in the next few years, such as Asynchronous Transfer Mode (ATM) and 100Mbps Ethernet. IsoEnet is being trumpeted by its inventor as the best way to send video across the network because each end of an isochronous link is connected by a synchronised channel.

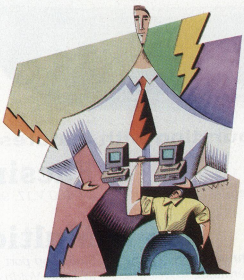
An IsoEnet connection begins with a call from one node on a network to another requesting a clear connection. Once established, video and audio can then be transferred synchronously at up to 16Mbps (more than Ethernet's 10Mbps) as long as no other nodes simultaneously use the network.

National Semiconductor claims the 16Mbps data rate is fast enough to conduct synchronised video conferencing at 20 to 30 frames per second (fps). Ordinary packet-switched Ethernet can get bogged down at seven to 10fps, at which point voice and video appear to lose lip synchronisation.

The desire for greater networking bandwidth is nothing new, and there are a number of alternatives. Ethernet switching-hub technology doubles the bandwidth of existing Ethernet LANs by letting them send and receive at the same time. Fast Ethernet, a proposal that increases the bandwidth up to 100Mbps, is coming on strong, as is ATM. But National Semiconductor claims that its rivals fail to provide the guaranteed bandwidth for video.

National Semiconductor expects that many companies will want to run multimedia and video conferencing applications over existing networks. At a fraction of the cost of an ATM network, isochronous networks could provide a low-cost alternative. But it's not no-cost — you'll still have to buy new adaptors and hubs.

Christopher Barr



No room on the desk for ATM

The message from Ungermann Bass' international marketing manager, Bill Lozoff, is that ATM is a great idea, the time and power of which has probably not yet arrived.

It is unlikely that even heavyweight network users will require as much bandwidth at the desktop as ATM can deliver, even in the medium term. For backbone delivery, ATM holds much promise, in both transmission and security. "Low-level deployment of higher capacity infrastructures such as ATM does not involve ripping out what's already there, whether it be Ethernet or token ring, but a more integrated approach," Mr Lozoff said.

Broader demand for ATM will probably start to be felt in the 18 to 20-month time frame, and Ungermann Bass anticipates that it will deliver product to meet demand. "If, however, we're proven to have underestimated the demand schedule, we are confident of being able to deliver on an earlier time scale if required," Lozoff added.

Visiting Australia to outline the corporate and philosophical changes underway at Ungermann Bass with the appointment of the company's new CEO, Roel Pieper, Lozoff also outlined his view of the data transmission demands of the present and foreseeable future.

The migration path from low-speed, low-capacity networks to high-speed, high-capacity is steady, with the limitations of Ethernet and token ring becoming more apparent as more users demand more network space, and need to process more information faster. There's a lot of growth left in the market for FDDI, Lozoff asserted, in the marketplace's incremental rise towards ATM. The evolution of bandwidth is also a gradual phenomenon, and Ungermann Bass notes more consistency in its international marketplace than at home in the US.

On the corporate front, the company is moving to consolidate its dedicated following in the high end, while making opportunities for itself in the mid range, 'second tier', the market sector showing the greatest opportunities.

The company will additionally create a business services division to offer a more complete networking expertise than simply providing product. The SI-like endeavour will nevertheless only be based on UB equipment. "We are not interested in earning 10 per cent on being the network integrator constructing a network based on other people's product," said the general manager for

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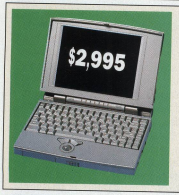


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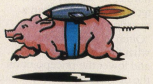
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northern region, Colin Watson.
Helen Dancer

Real-world applications will drive desktop video

Demonstrable business benefits will drive the acceptance of desktop video conferencing, rather than issues of cost or compression, according to CLI senior vice-president, John Walsh.

The company's Cameo Personal Video System, which is represented in Australia by NetComm, will be one of the pivotal technologies which will take telecommuting away from the larger public telecommunications companies and onto the individual's desktop, according to Walsh, who visited Australia in November to present a keynote address at Macworld.

CLI' s early work made significant strides in the development of sophisticated codec (compression/decompression) algorithms, and much of this early work forms the foundation for standard codec procedures. The next major hurdle, he asserts, is less a technological one, than a question of application. "Often, if you ask people what they would use it for, and lower the pricepoint on the discussion, other spurious objections are raised. Cost and issues of compression are often subterfuges; the real issue to address is what am I going to do with it that will justify the investment?"

Research from the Yankee Group has demonstrated that at a pricepoint of over $5000 there is minimal interest, at $2 to $3000 around 18 per cent of the surveyed population would consider desktop video, and at less than $1000 the interest level was around 50 per cent. The utility of desktop video increases with the number of people you can use it to talk to, Walsh asserts, and says that this factor alone will speed the desktop video push into the consumer market.

In the business environment, however, desktop video makes the justifying process more specific, in that each individual must be able to articulate the business benefits that will accrue from their personal use, rather than justify the rationale for video for the group, which is, of course, easier to do.

Costing the development of the Cameo project was aided by the existing research and development work the company had done for AT&T. "At the end of that project we had codecs that were inexpensive enough for us to segue the technology over to the Cameo product at a reasonable cost," Walsh said.

The concept of video on the desktop is gaining momentum, with a quantum increase in the number of what Walsh refers to as 'tyre kickers'. "They come and look, and I ask them if they know what they are going to do with it, or if they have just come along to kick the tyres," he said. But the market is changing.

"There was a time when my job was akin to convincing people that there was a God. Now it is more like trying to persuade them that my religion is better than the next guy's."
Helen Dancer

Artisoft to connect and protect

Artisoft has released four new companion products for its peer-to-peer networking package, LANtastic, to aid users in protecting their information by backing up more frequently, and better connectivity to Macintosh and TCP/IP environments.

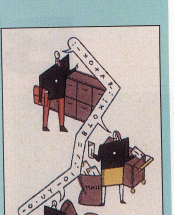
The first, Central Station II connectivity processor, provides connectivity for up to five ports (two parallel, three serial) and for up to five printers at a time. It also provides laptop to Ethernet for LANtastic or NetWare NOS. Special offers are available for existing LANtastic users, and the RRP for Central Station II is $882.

ArtiSave is designed to encourage users to do the job that never gets done — backup. Developed in conjunction with Mountain Network Solutions, Artisoft's ArtiSave Backup software will run on any server to back up the drive or the whole network, either selectively or automatically. Librarian features are designed to minimise administration and facilitate file searching in archives. The software-only ArtiSave will retail for $503, and a hardware/software bundle incorporating a Mountain Network Solutions SideCar II parallel port tape backup drive will cost $1033.

The LANtastic for Macintosh Windows Gateway is the follow-on for the Macintosh for DOS gateway released last year, making it easier for mixed architecture environments to network. The system allows a non-dedicated Windows PC to act as a gateway between AppleShare and LANtastic networks.

The fourth product is a free update to LANtastic for TCP/IP, which connects PC networks to other systems such as DEC VAX, HP and Sun workstations, as well as mainframes and NCR and AT&T minicomputer systems. The new release features a Windows-based script compiler that allows common terminal emulation tasks to be automated and increased flexibility for printer use across the network.
Helen Dancer

Novell gets personal



Novell has added Personal NetWare to its range of networking options. Designed as a flexible, upgradable peer-to-peer networking bundle, Novell will sell Personal NetWare for $190 per single licence or $750 for a five-user licence.

Recognising that the largest growth in networking is coming from smaller installations for which peer-to-peer is a more cost-justifiable networking option, and that peer-to-peer provides a smoother transition to what the company terms 'the more sophisticated services of NetWare', Novell has targeted entry-level network users, and small workgroups looking for ways to maximise resources.

A highlight of the functionality of the new release is its seamless integration to fully-fledged NetWare packages, a clear indication that Novell's intention is to use the peer-to-peer option to steer users into client/server networking, an area in which the company finds itself on more solid ground.

Novell still takes a far second place in the peer-to-peer market to Artisoft, the company which produced the popular LANtastic. The product achieved a breakthrough in the mindset that networking was for larger companies and fatter expense accounts, causing the company to take and maintain a major market share of peer-to-peer networking.

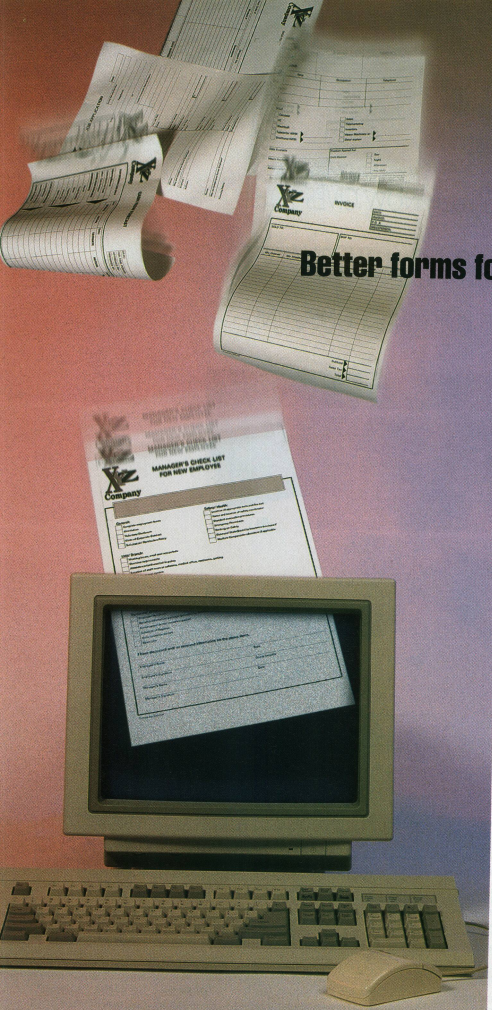
Sharing files, CD-ROMs, printers and other peripherals, and installing electronic mail are high on the company's agenda as appropriate situations for considering Personal NetWare. Network management is simplified, using SNMP and Novell's Network Management Responder, as well as the use of a distributed and replicate resource directory, drawn from NetWare, which allows access to all available network services and resources through a single login.

For more information, contact Novell, (02) 925 3000.
Helen Dancer

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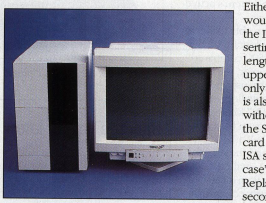
JCA14

First PCI bus machine shows video improvement

The first PCI-local bus machine we've seen, the AuStar EFX 4DX2-66P breaks one rule for new technology before it's out of the box. It isn't phenomenally expensive. Usually new technologies enter at the top of the market from companies like Compaq or IBM, working in partnership with Intel, and then trickle down through the price lists over the following two years. Instead of the $10,000 you might expect for the first member of a new generation, the price on the standard AuStar is $4700 for a 486DX2/66, and $5650 for the Pro model with 8M of RAM, CD-ROM drive and 16-bit soundcard. This price underlines just how mainstream PCI is, even at its debut.

The AuStar is a machine with a lot of potential — potential that isn't fully realised in the configuration provided for review, mostly due to the limitations of the ISA-based I/O controller used. The minitower 4DX2-66P is the same case design as the Editor's Choice Compro from our October comparative reviews. It is sleek and quite well laid out, with an opening door at the lower front exposing dual 3.5 and 5.25in floppy drives, power and reset buttons, and a Panasonic double-speed CD-ROM drive. The case can take persuasion to remove, and letting it slip at the wrong moment cost a band-aid and a number of expletives.

The motherboard uses a May-dated Award ISA/PCI BIOS, and sports the Intel Saturn chipset, with an Intel Overdrive and 256K direct map cache. The processor has a fan mounted on it, which would be an intelligent idea except that the positioning and distance that the fan juts out means you can only use one full-length ISA card. There are three of the new PCI local bus slots, but then only three ISA slots in addition to these, and the Pro machine we evaluated had only one of these free, due to the presence of the SoundBlaster 16 card and the unit's use of an ISA-based IDE I/O controller. One of the PCI slots was occupied by a 32-bit PCI-local bus Windows accelerator card with 1M of VRAM based on the popular S3 graphics engine. The other two PCI slots were unoccupied.



Chipsets and drivers still have room for optimisation for PCI

The system comes as standard with 8M of RAM, using 72-pin SIMMS, expandable to 64M. Most interesting, but unused, was an NCR SCSI/SCSII on the PCI bus, which AuStar claims has a burst transfer rate of up to 110M/sec.

The most productive change that could be made to this system is the swapping of the ISA drive controller for a PCI-based caching controller when one is available. Despite the use of a Maxtor 245M drive, which is well regarded, disk performance under DOS was good for its class at 38.57, but lacklustre compared to VESA-based systems with onboard cache.

An alternative would be to swap the IDE drive for a SCSI drive, using the onboard SCSI controller. That'd scream!

Either change would free one of the ISA slots. Inserting a full length card in the upper slot (the only one possible) is also difficult without removing the SoundBlaster card in the second ISA slot due to the case's top support. Replacing this second card is then difficult due to the presence of a small rivet.

According to AuStar, only six, not seven slots can be filled, as the PCI bus system has what the company terms *reserved bus slots*. In effect, you can have four ISA cards, but then you'd only be able to use 2 PCI cards, or you can have three of each.

This machine is blatantly a Windows box. Disk performance under Windows with 2M of Smartdrive was 41287K WinMarks. Graphics performance was slightly better than any of the VESA-local bus DX2/66 units I've evaluated, with an optimal score of 24,703,400 million WinMarks, although some vendors like Dell are now claiming results like 65 million. There must be a point where the figures become academic, however. It is reasonable to say, though, that VESA and PCI performance for the bulk of clones is going to be roughly equivalent until there are drivers and chipsets optimised for the new bus architecture.

DOS video performance was unexciting, with a video harmonic of 6084. Other scores (processor 16899 and memory 8220) were as expected.

The Mag 15in screen provided is digital, with a clean, consistent image and high configurability. There was some pincushioning and the image was marginally unstable around the edges, which could easily be fixed, but the monitor did not handle 1024 by 768 or higher output resolutions without suffering a bad case of the Windows jitters. The Honeywell keyboard and Microsoft Mouse Version 2.0 are best of class peripherals, and five CDs are included with the SoundBlaster kit.

Jeremy White and Chris Cook

AT A GLANCE

AuStar EFX 4DX2-66P Pro series

Distributor: AuStar
Telephone: (02) 550 5440
Price: $5650 (486DX2/66, 8M RAM, 245M drive, CD-ROM, 16-bit SoundBlaster, 15in Mag screen)
In short: The first of the new PCI generation offers excellent Windows video performance, but could be really boosted by replacing the ISA-based IDE drive controller with a PCI controller, or replacing it altogether with a SCSI-based configuration.

IBM's ThinkPad 750C: A good thing in a lighter package

If there's one division in the new IBM that can pull the computer giant back from the brink of disaster, it's the Mobile Computing group of the IBM Personal Computer Company. The four models in the new ThinkPad 750 family are remarkable. Each is built around an Intel 33-MHz 486SL processor, but each is targeted at a slightly different user and price point.

You can choose among the monochrome ThinkPad 750, the active-matrix colour ThinkPad 750C, the pen-convertible ThinkPad 750P, and the soon-to-be-released dual-scan colour ThinkPad 750Cs.

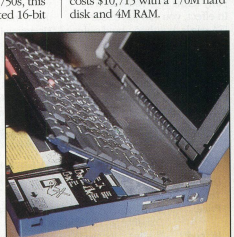
We evaluated one of the first active-matrix colour models to come off the line. $10,715 isn't an unreasonable amount to pay for the industry's only 10.4in active-matrix colour display, the innovative TrackPoint pointing device, a 170M hard disk, 4M RAM, a 2.88M floppy disk drive and a Type III PCMCIA slot. But the ThinkPad 750C's feature list extends even further.

Like all ThinkPad 750s, this model has an integrated 16-bit stereo audio subsystem and a high-fidelity speaker, plus input/output jacks for microphones, headphones or portable speakers. The unit we saw was also configured with IBM VoiceType Control, a rudimentary speech recognition software program that gives you voice control over basic commands under Microsoft Windows.

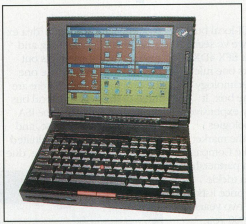
You might expect to give up performance in order to get such a feature-filled notebook, but the ThinkPad 750C consistently surpassed the average benchmark test scores for 33MHz 486DX-based notebooks. The 750C's scores on the Video and Graphics Winmarks tests were especially impressive, and its battery life of almost three hours was a pleasant surprise considering the system's active-matrix display.

IBM has been able to shave about a half a kilogram off the weight of the 750C compared with its predecessor, the 720C. The 750C weighs just under three kilos with its floppy disk drive installed (2.7 kilos without it). An extra battery adds less than half a kilo to the travel weight, and the AC adaptor is one of the smallest designs ever to fit in a carry-on.

If active-matrix colour matters less to you than the money you need to spend to get it, the passive-matrix, dual-scan colour ThinkPad 750Cs should be out soon. It's configured the same as the 750C except for the display technology, and it costs $10,715 with a 170M hard disk and 4M RAM.



Under the hood: *a pop-up keyboard makes upgrading the ThinkPad easy*



Less is more: *the 750C is a pound lighter than its predecessor*

Upgrade now or later

The ThinkPad 750C and the rest of its family are a study in upgradability. The keyboard on every 750 pops up so you can access the removable hard disk, the nickel hydride battery, and the floppy disk drive. You don't have to pry the keyboard open; it tilts up easily and then snaps back into place when you close it. Below the floppy drive bay is a DRAM memory card slot for upgrading the system's memory to 20M.

If you want to cut down on travel weight, leave the floppy disk drive at home. If you want several workers to share a single ThinkPad 750, they can each have their own hard disk and then if you need to swap batteries you don't have to power down the computer. In the early part of 1994, IBM will ship the ThinkPad TV Tuner Module, which will give you onscreen television and VCR playback capabilities. IBM has released the specifications for its floppy drive bay in the hope that third-party vendors will develop other modules for the ThinkPad 750 series.

Multimedia docking station

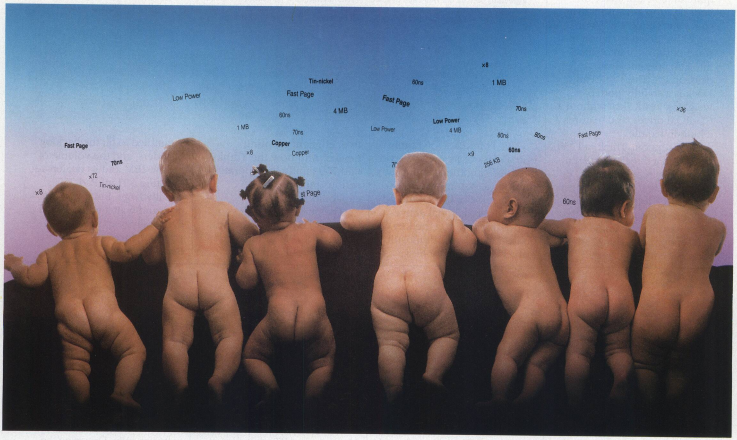
The ThinkPad 750 family brings with it a new docking station. To fully use the 16-bit audio subsystem in the new ThinkPad, IBM has introduced the $1616 ThinkPad Dock I, which comes with two built-in stereo speakers, a drive bay that accommodates either a CD-ROM drive or a hard disk, an additional SCSI port, and a 16-bit ISA slot.

AT A GLANCE

IBM ThinkPad

Distributor: IBM Direct
Telephone: 008 815 154
Price: IBM ThinkPad 750C (incl. 4M RAM, 170M hard disk, DOS 6.1, Windows 3.1) $10714.28; IBM ThinkPad 750P (incl. 4M RAM, 170M hard disk, PenDOS, Windows 3.1, Windows for Pen Computing) $7326.25; ThinkPad 750 (incl. 4M RAM, 170M hard disk, DOS 6.1, Windows 3.1) $6295.36
In short: Get in early to take advantage of these efficient new products from IBM.

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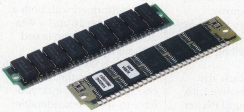
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The ThinkPad Dock replicates all the standard ports of the notebook PC. It doesn't require much extra space on your desktop because you attach your ThinkPad 750 on top of the docking station instead of sliding it into something that resembles a desktop PC. The ThinkPad Dock is also fully portable, weighing just 2.7kg (without a CD-ROM drive), and features a built-in handle.

IBM supports ThinkPad 750 users with a three-year warranty, a 30-day money-back guarantee, and 24-hour, seven-day-a-week toll-free technical support. Through the IBM Express Repair programme you can send in your ThinkPad 750 for service free of charge.

Benchmark tests: IBM ThinkPad 750C

The IBM ThinkPad 750C consistently outperformed the average 486DX/33-based notebook computer. It performed especially well on the video and Graphics Winmark tests. Its battery weighs less than a pound and has exceptional longevity for an active-matrix colour notebook battery.

We used PC Labs' Hardware Benchmark Tests, Release 7.1, to measure the IBM ThinkPad 750C's processor, memory, video and disk subsystem performance. The DOSmark is a composite rating derived from these four scores. The Graphics Winmark is based on 10 Windows graphics and text functions.

	Higher scores represent better performance						Lower scores represent better performance	
	Processor (operations per second)	Memory (kilobytes per second)	Video (millions of operations per second)	Disk (kilobytes per second)	DOSmark	Graphics Winmark (megapixels per second	Battery Rundown (hours:minutes)	ZDigit Rundown (hours:minutes)
IBM ThinkPad 750C	7420	5325	3828	29.70	27.82	3.90	3:07	4:35
486DX/33 average	6963	4997	1999	26.04	24.73	2.80	2:09	1:47

The ThinkPad 750 family is in a class of its own. We've yet to see another vendor produce a system with a display the size of the ThinkPad 750C's 10.4 diagonal active-matrix display, and the keyboard-based TrackPoint still stands alone as an innovative, efficient pointing device. And now the ThinkPad 750 family incorporates serious multimedia capabilities.

The question is, will you be able to buy one? Previous versions of IBM's ThinkPad were so popular that IBM scrambled to fill the backlog of orders, and the volume of calls to IBM and its dealers requesting a ThinkPad 750 is equally large. But if you act now and wait a while, you'll eventually reap the fruits of your patience.

Brad Grimes

$150 VoiceAssist listens to you

We're still a long way from *2001: A Space Odyssey*'s "Open the pod bay doors, Hal," but voice recognition on the PC at least has the door ajar. Hands-off operation is possible with the right combination of hardware and software. One of the most usable kits is Creative Labs' $150 VoiceAssist, a voice training and recognition package that works within Windows. It may not have the wide-ranging components of something like the more expensive Microsoft Windows Sound System, but it does succeed at its designated task: telling your PC what to do.

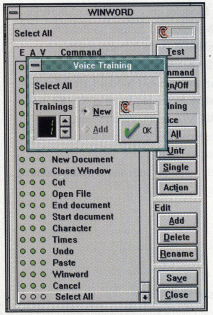
VoiceAssist, which also ships as part of Creative Labs' 16-bit series of Sound Blaster sound boards, comes with a too-large, unidirectional microphone that plugs into any supported sound card. Creative Labs neglected to include a stand for the mike, so you'll have to hold it like a lounge singer or lay it on the desktop. Neither solution is adequate. The company would be smart to copy the kind of elegant microphone that Microsoft provides with its Sound System.

Naturally, VoiceAssist works with Creative Labs' own Sound Blaster and Sound Blaster Pro, as well as the numerous compatible clones of that audio standard. It also handles the 16-bit board within the Windows Sound System. Installation of VoiceAssist itself is a snap, for it assumes you've already gone through the setup nightmares often associated with audio hardware. In testing, the program performed with both a Sound Blaster 16 and a Windows Sound System board without a glitch.

Setup is far from over even when you have the software on the hard disk, since you have to spend considerable time creating new voice commands, training those commands, and associating macrolike recordings with them before your PC responds to the spoken word.

VoiceAssist installs a short slate of 24 generic commands such as open, close, left and right that work within all Windows applications. Go to sleep and Wake up commands are included to turn the microphone off and on.

VoiceAssist is also ready to run File Manager, Program Manager, and Windows' applets such as Cardfile and Calendar. You can't change or add to the generic commands — a serious flaw, considering the many commands shared by most Windows apps — but you can change the application names to better suit your software suite. Dropping the trivial Clock and substituting Word for Windows, for instance, only takes a moment.



Listen up: *training VoiceAssist to recognise your voice is straightforward*

VoiceAssist lets you define multiple users, each with their own way of pronouncing commands; supports more than 29,000 commands per user; and makes 1024 commands available at once.

To add commands specific to an application, you select a user, ensure that VoiceAssist is active, and then launch the application. Like the Windows Sound System's Voice Pilot voice-recognition module, VoiceAssist automatically extracts the menu items from the application so that all you do is train the voice. That speeds up the process of adding voice recognition considerably.



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PHOTO OTTO ROGGE

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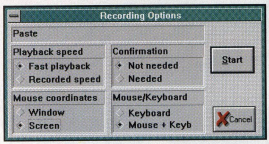
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ETC GROUP

Custom commands

You can also build custom commands in a short three-step process of naming the command, training its voice, and assigning a macro. To add the command 'New document' to Microsoft Word for Windows, for example, you simply type in the name, say 'New document' into the microphone, and then record the keystrokes necessary to call the File menu. Then you select New and hit Enter.

VoiceAssist is smart enough to know what application is active and change its library of commands accordingly. And its 224-command-per-application limitation shouldn't restrict even the most vocal user. Once trained, even with just a single iteration during training, these commands work remarkably well. In fact, when compared with the hit-and-miss success of Voice Pilot 1.0, VoiceAssist was far more reliable. Voice Pilot had trouble distinguishing between 'close' and 'tools', and thought it heard 'enter' when 'character' was spoken. VoiceAssist knew the difference and acted appropriately. (Both had been rigorously trained in Word for Windows, and both were using the input microphone and sound board from the Windows Sound System.) A success rate of 90 per cent or higher was common. Nothing is foolproof, of course. Like all such programs, VoiceAssist is virtually unusable in a noisy office, where background sounds, music and voices can be misinterpreted as commands, with potentially disastrous effects. And its documentation is scanty, with all-too-brief mentions of important features. But at just $150, with easy training and an outstanding recognition rate, VoiceAssist is a package to talk up. ***Gregg Keizer***



Follow me: *VoiceAssist records keystrokes and mouse movements*

AT A GLANCE

VoiceAssist

Distributor: Creative Pacific
Telephone: (02) 906 8887
Requires: 4M RAM, 1M hard disk space, Windows 3.1, 8 or 16-bit sound board.
Price: $150
In short: VoiceAssist voice training and recognition software for Windows that adds and executes spoken commands, works with amazing accuracy. Its most prominent flaws are a second-rate microphone and an inability to modify or add to its Windows-wide generic command list.

Canvas: Illustration without hassles

Deneba Software's Canvas for Windows 3.5 bridges the gap between low-cost and high-powered drawing programs. At a price of $599 (special offer until December 31 of $295 available), you wouldn't expect this program to compete with big guns like CorelDRAW and Micrografx Designer, but in many ways it does.

Canvas distinguishes itself with the unique ability to edit bitmapped elements side by side with vector objects. Admittedly, Canvas' painting functions are extremely basic. A small floating palette contains rudimentary tools such as a paintbrush and a spray can. But even these simple tools make it possible to integrate bitmapped pictures into a layout more precisely and efficiently. For example, using the Objects Specification dialogue box you can change the size of a picture without degrading quality because Canvas lets you increase or decrease the resolution or bit-depth as needed.



Drawing: *this logo was created with Canvas' standard drawing tools*

Getting technical

Technical illustrators will love the program's collection of specialised drawing tools. Canvas has no fewer than 15 different dimensioning lines, each one of which can be customised with labels, scaled units of measure, and precision levels that vary from whole integers to four decimal places. So in addition to the standard horizontal, vertical and diagonal dimension lines, Canvas can indicate the radius or diameter of a circle and the number of degrees in an angle. The one shortcoming to Canvas' implementation of dimension lines — the fact that they are not associative — is easily overcome by grouping the dimension line with the object it measures.

While most drawing programs let you constrain your mouse movement to the perpendicular axes or 45-degree angles, Canvas' Smart Mouse function will keep track of any combination of 12 different constraint conditions. Canvas rounds out its technical drawing tools with the ability to separate a drawing into discrete layers, redraw complex objects with a macro tool, and read and write .DXF and IGES formats.

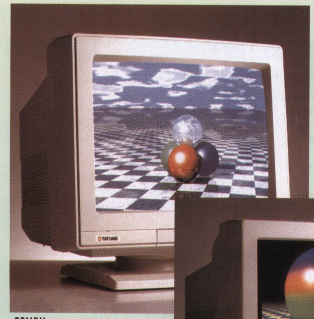
Of course, Canvas has standard drawing tools including ovals, rectangles, lines, arcs and Bezier curves. Whenever possible, the program tries to make drawing and editing objects as easy as possible. Object-level tools like cubes, concentric circles, parallel lines and starbursts make creating complex elements as easy as dragging the mouse.

Canvas is no slouch when it comes to special effects, either. One and two-point perspective, extrusion, enveloping and blending let you

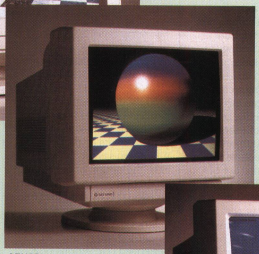
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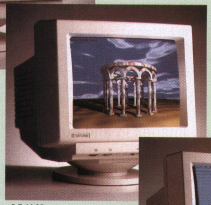
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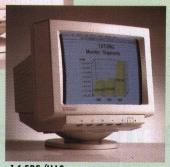
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quickly add three-dimensional, warping, and tweening effects to your drawings. For example, the word Frog, shown in the accompanying screen shot, was manipulated into its free-form shape by using the Bezier envelope. Unlike CorelDRAW and Gold Disk's Professional Draw, however, Canvas does not maintain special effects or the envelope for subsequent manipulation, so after you've created an effect you'll find that the only way to fine-tune the result is to remove the special effect and start over again.

The same annoying situation is true of test effects and simple text wraps. If you apply two effects to a text object, the word is automatically converted to curves and can no longer be edited as text. You can align text to a path, but to adjust the path you'll have to undo the effect. You can easily flow text around — or even into — an object, but when you modify the layout you'll have to explicity remove the text wrap and reapply it.

In addition to the special text effects, you can format any of the 25 TrueType fonts that ship with the program as paragraphs text (Type 1 fonts are also supported, but not bundled). The program's text linking, alignment, leading, kerning, and tab capabilities are sufficient for most text layouts, but Canvas doesn't support paragraph level formatting, such as indents, bullets or margins. With 120 bitmapped patterns, 18 predefined hatch patterns, and over 300 clip-art images, you can easily dress up your designs. The program also supports five different colour models, including Pantone. Applying colours or gradient colours to an object is as simple as clicking a choice in a palette. You can mix custom colours on the fly, but ultimately it's more efficient to create custom colours and gradients and save them to reusable palettes that are quickly accessed as toolbox flyouts. A Canvas document is limited to a single page, but with a maximum page size of over 2.75m and the ability to print large documents as a series of tiles, you can still produce a wide variety of documents.

Images in and out

You can incorporate images from other sources into your Canvas creations in one of two ways: either create OLE objects or open other file formats (such as .BMP, .DXF, EPSF/AI, IGES, .PCX, TIFF AND .WMF) directly. Canvas also lets you save your drawings in the same wide range of file formats — plus one. When you save a file, you have the option of generating separations — creating either individual PostScript files for each colour or a single QuarkXPress .DCS file.

During our testing, we experienced one serious bug. Exporting files as Encapsulated PostScript or via the Windows Clipboard often resulted in corrupted images that could not be printed on a PostScript printer. In addition, gradient filled objects exported to the TIFF format were plagued with artifacts, such as white bands that cut across several areas of the image. Deneba should have a solution in place soon.

Advantages to Canvas' open architecture include the ability to customise many of the tools and the ability to load only those tools you need. Modifying a tool is as simple as opening the associated Manager dialogue box. For example, you can customise the size and shape of arrowheads or adjust the sensitivity of the pressure pen. Advanced users will also appreciate the ability to create custom toolsets, which can be chosen at startup. So if you don't need the Concentric Circle tool, you never have to load it.

Luisa Simone

AT A GLANCE

Canvas for Windows Version 3.5

Distributor: Pica Software
Telephone: (03) 326 5255
Requires: 4M RAM, 9M hard disk space, Windows version 3.*x*
Price: RRP $595 (special offer until 31st December, $295); upgrade price of $199; crossgrade price of $230
In short: A wonderfully versatile drawing program with the unique ability to edit bitmapped pictures from within a vector drawing. Canvas is strong on technical drawing functions such as dimensioning lines, drawing constraints and macro objects.

ScanMan EasyTouch: steady hands

Logitech's ScanMan EasyTouch goes a long way toward eliminating the negative reputation of handheld scanners. This 256-shade grey-scale scanner hooks up to your PC's parallel port, sets up in minutes and comes with both image-editing software and an optical character-recognition (OCR) package.

Although it automatically stitches 4.5in-wide swatches into images up to 8 by 15in, it's still nowhere near as convenient as a flatbed scanner. But for $495, EasyTouch is fine for users on a budget.

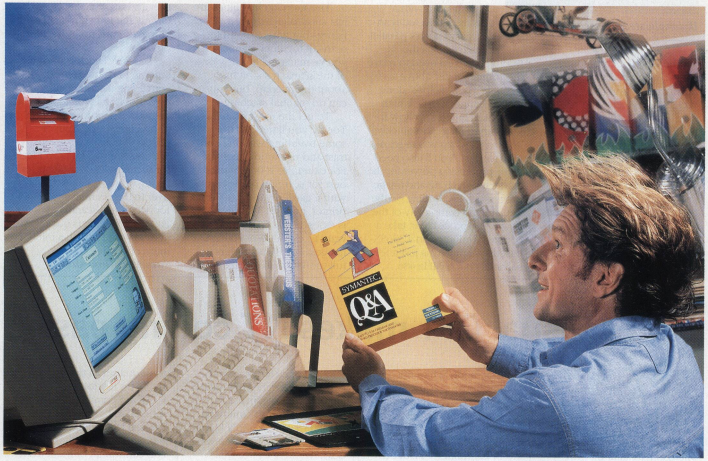
The radical design of EasyTouch is immediately noticeable. The half-moon arrangement looks awkward at first, but the wisdom of its ergonomic design is evident the first time you grab it. Instead of the twisted-wrist posture needed for other hand scanners, the EasyTouch lets you extend your hand straight out. Also notable is the lack of the usual assortment of switches and sliders. There's just a solitary button and an LED. Resolution and contrast are controlled through software.

The EasyTouch's parallel port connection eliminates the hassle of opening up your PC and dealing with an add-in card. It's also perfect for use with a laptop, if you don't mind the tangle of hardware and wires. The pass-through connector that you connect to your PC's parallel port is sizable. With the printer cable attached, it extends nearly 20cm from the back of your PC. The connector is designed to let you use both the scanner and a printer through the parallel port, although obviously not at the same time.

The installation software tests to make sure the scanner works and then installs the two applications that make the EasyTouch truly useful. FotoTouch 1.2 is a feature-filled image- editing package that also handles colour for work with images other than the grey scales generated by EasyTouch. And there's OmniPage Direct AnyFont OCR, customised by Caere Corporation for use with the EasyTouch.

Logitech has left out only one important thing: an uninstall option. Since the EasyTouch install creates multiple directories, copies files into your \WINDOWS directory, and edits both your WIN.INI and SYSTEM.INI files, the lack of a way to uninstall it if you move the scanner to another PC is a major oversight.

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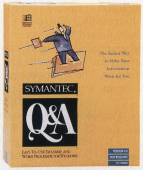
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Uncomplicated: *Logitech's sleek design*

The EasyTouch is compatible with any Twain-compliant application (Microsoft Word, Aldus PageMaker, CorelDRAW and Lotus Freelance, for example), so once it's installed, an 'Acquire' option appears on the application's File menu. The scanner's working menu then pops up, and it's a simple matter to follow the directions on the screen. When you want to scan in text for OCR, OmniPage adds an 'Acquire Text' option to your application.

We found that getting the most from EasyTouch requires practice and patience, not to mention a steady hand. Don't try scanning after your fifth mug of morning coffee. A large, flat and not-too-slippery area for the image you're scanning is also crucial; if the photo or paper moves, you'll have to start again.

Compared with a directly connected scanner, EasyTouch's parallel interface limits the throughput. You need to move the scanner at just above a snail-like pace, helped along by the scanner's LED, which turns from green to yellow if you start to move too quickly, and to red when you're scanning too fast. You'll also need some processing power for the automatic stitching and image processing. Depending on the size and the complexity of the image, the process can take a couple of minutes on a 386SX-based system versus just a few seconds on a 66MHz 486.

AT A GLANCE

ScanMan EasyTouch

Distributor: Logitech
Telephone: (02) 360 1098
Requires: 4M RAM, 5M hard disk space, Windows 3.1, parallel port
Price: $495
In short: A next-generation parallel port grey-scale scanner that's easy to set up and use. However, not designed for heavy production or tight deadline use, it also requires a steady, patient hand.

The AutoStitch abilities are just short of amazing: it figures out where multiple scans fit together even if you've managed to skew one of the scans. It's a bit fussy about the overlap, but you can do manual stitching.

To get the most from EasyTouch, you'll need to do some tweaking with the contrast and resolution settings. For example, 100dpi works best for scanned photographs with a garden-variety 300dpi printer, and the 300dpi setting is essential for OCR. If you want to clean up or change images, FotoTouch offers a full toolkit of image manipulation and drawing tools. And OmniPage is a shining example of current OCR technology.

The EasyTouch is great for scanning in a quick image or converting a short document to data. But it still won't replace a flatbed scanner for serious production work. And, of course, it doesn't do colour. We also found it far from ideal for scanning in documents for faxing (it was quicker to walk over to the fax machine). Still, for occasional scanning chores, EasyTouch delivers quality images to your PC with a minimum of hassle.

Stan Miastkowski

32-bit Visual C++ makes NT coding easier

With integrated code-generation, C++ class management, editing, debugging and object browsing, Microsoft's Visual C++ for Windows was one of the most important new software development tools to appear in 1993. Based on a robust application framework, the Microsoft Foundation Class Library (MFC), Visual C++ easily turned Windows programming drudgery into artistry full of snap, crackle and pop. The competition is scurrying to imitate it.

Unfortunately, Visual C++ for Windows can't run on or generate 32-bit code for Windows NT, but now Microsoft has taken care of that problem by introducing a $795 Visual C++ 32-bit Edition for Windows NT and Win32s development. While not as comprehensive as the Win32 Software Development Kit (SDK) — there's no replacement for the SDK's Setup Toolkit, RPC toolkit, or OLE 2.0 Beta toolkit — Visual C++ 32-bit Edition has the essential tools for developing 32-bit applications for Windows NT or Win32s (which is included in the package.)

The 32-bit Edition's Visual WorkBench (VWB) is essentially the same as the one in Visual C++ for Windows. But because it takes advantage of NT's multithreading, it's a crisp, robust environment. It's even easier to switch Windows and development modes, make changes to options, or edit code — all while compiling or debugging in yet another window. With new additions (such as the integrated profiler), the 32-bit VWB also features a Find in Files dialogue for performing GREP-like searches of multiple files, a Break command for debugging, a Stop command for external tools, and a highly requested Memory dump window.

Unlike the character-mode editor in the SDK, the Visual WorkBench editor is fully graphical. The integrated debugger can debug multithreaded applications and specify exceptions to trap and how to handle them. The integrated Source Code profiler replaces the SDK's API profiler, and Visual C++'s AppStudio easily supplants the comparatively primitive resource editors in the SDK.

There's also SPY ++: an inspection tool that divulges the most intimate details of NT processes, threads, windows, window classes and messages. SPY++ alone is worth a good quarter of the price of the 32-bit Edition.

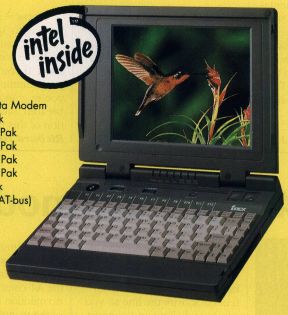
All the command-line tools in the 32-bit Edition of Visual C++ are DOS-extended using Phar Lap's TNT technology. You can run all of them from Windows 3.1 or the MS-DOS command line, and there's no need to modify them or to use a DOS extender.

The 32-bit version of MFC remains largely compatible with the 16-bit version. MFC programs that don't use 16-bit-specific features of Windows can be recompiled with the 32-bit version with almost no modifications. The only stumbling blocks involve changes to a couple of MFC member functions and differences between the Win16 and Win32 APIs. If you have avoided using the APIs directly, the latter won't be a problem. The package also includes CVT-

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MAKE, which can convert most of your 16-bit Visual C++ makefiles for use with the 32-bit Edition

The 32-bit Edition's C++ compiler includes features to optimise code for 386, 486 and Pentium machines. Optimisations for 486s include scheduling, code alignment, and frame pointer omission; Pentium optimisations include instruction re-ordering and the use of simpler code sequences. But the 32-bit VC++ generates 32-bit code for Intel PCs only. You cannot use it on the MIPS or DEC Alpha hardware, or generate code for those platforms or for 16-bit Windows. You'll need the Win32 SDK for those platforms to port any programs you create. And while you can easily recompile MFC and MFC applications on the MIPS, there's currently no support for MFC on the Alpha.

Like most new NT development tools, the 32-bit Edition is available on a single CD-ROM that includes documentation, tools, and four installation options. While print versions are available separately, the 10,000 pages of documentation are provided in 'Books On-Line', an invaluable, cross-referenced reference tool that includes the full documentation for the Win32 SDK and Win32s; C/C++ language references, overview and API documentation. If you've developed with 16-bit Visual C++ for Windows, you may be a bit disappointed. For example, Visual Basic control (VBXs) aren't supported in Windows NT; you can't use VBXs in your 32-bit VC++ applications.

MFC has its limits, too. There's no 32-bit MFC DLL and you'll have to link your applications to the static MFC libraries. Plus, MFC does little to encapsulate features of the Win32 API; multithreading, console I/O, memory-mapped files or the 32-bit GDI. While you can use these in your applications, there's no built-in support.

If you're a 16-bit developer moving to 32 bits, you may miss VBX support. But there's no better tool for NT development. If you're already programming in 32 bits, you're going to love the breadth, scope and integration of this package.

Richard Hale Shaw

AT A GLANCE

Microsoft Visual C++ 32-Bit Edition for Windows and Windows NT, Version 1.0

Distributor: Microsoft
Telephone: 008 062 062
Requires: 16M RAM, 16M hard disk space (completely installed), Windows NT, Version 3.1
Price: $795
In short: The best C/C++ development environment for Windows NT and Win32s. While some developers may be disappointed with the lack of support for 16-bit VBXs, Win32 and NT developers will find it an excellent addition — if not a replacement — for the essential tools in the Win32 SDK.

Banksia PCM14.4F card fax/modem

The trouble with new technology is you can never keep up. Just when you thought you had communications tapped with the latest V.32bis fax modem sitting on the desktop, somebody brings out something better. In this case it is a Banksia V.32bis fax/modem which sits in your notebook and does everything from inside a credit card-sized sliver of plastic with no batteries required.

The Banksia comes in a neat video-cassette-style case complete with all the leads, connectors, software and manuals required. The software bundled is QuickLink II for Windows and DOS, and QModem. The former is fax and data, the latter data only and manual-less. Both the modem and QuickLink II have their own manuals.

Installation of PCMCIA card modems must be the easiest on earth. Fitting it into a Zenith Z-Lite took about three seconds. Open the flap, push it in and boot the machine. No comms to set, cables to link or parameters to fix. In Windows, the COM port needed altering, but that was all.



Banksia's PCM14.4 fax modem is tiny and easy to install

Curiously, an extra disk was supplied with the kit labelled Modem Utilities and containing a file called HITME.EXE. This had no instructions but seemed to be something to do with PCMCIA configuration. Either way, it was not used but could definitely have benefitted from more information.

A DAA connector cord is supplied to plug into the card itself, and a Telecom-to-RJ11 lead to link the DAA to a wall socket. Once installed, the card uses the host PC's internal speaker to give audible feedback from the line so you can hear dialling and connect tones without problem.

Using the PCM14.4F was simple using the supplied software. Connecting and dialling time were no longer than a self-powered unit, and connects seemed good at all speeds up to 14,400bps. Faxing at the maximum Group 3 rate was not tested as these machines are still few and far between, but otherwise both data and fax transmissions worked well. The packaging says the unit can store multiple phone numbers and transmission profiles, but this highly useful feature is buried deep in the AT command section with no mention in the user section of the manual. The Banksia's Rockwell chipset supports V.42bis, and the card also caters for MNP2-4, but surprisingly in this quality of modem, not MNP5 or 10.

Although a relatively expensive accessory, this fax modem performs as well as the best around, comes with good software and fits in your wallet. Nonetheless, Banksia could tart up the manuals and instructions to good effect. Still, if you want to keep up . .

Jeremy Torr

AT A GLANCE

Banksia PCM14.4 fax modem

Distributor: Banksia Technology
Telephone: (02) 418 6033
Price: $1432
In short: Tiny and perfect. The manual is also tiny but less than perfect. Still, a good buy for the mobile technocrat who needs speed without too much power.

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Cyberspace a long time coming

BY JEREMY HOREY

Communication is going to play an increasing role in what we do with computers. Just what shape is the communications environment going to take?

The other day I was reading a magazine that specialises in portable computing. It was reporting on some estimates that by the end of this decade 25 per cent of all the traffic on the mobile or wireless communications networks will be data.

This is not a particularly high figure. In fact, it clearly highlights an important fact about communication in the next 10 years. Wireless or cellular communication is not going to replace wired communication.

Some people have suggested that by the end of the decade we will all be walking around with mobile computers and that we will never have to connect them to a wire again. This is not correct.

Today, there is technology that will allow you to transmit every single phone call going on at the peak load time (which is still Mother's Day) down a single fibre-optic cable. In fact, you could take 10-times that load down a single fibre-optic cable. While cellular communications have come a long way, that sort of capacity is not even on the horizon.

Clearly, this means that the idea of fully mobile working is not practical. You are not going to be able to sit in your car and have the same communications service that you can have in your office.

To be a full member of the network you will need to have your computer physically attached to the network. This will give you full access to all the data resources as well as full communications facilities like data and video conferencing — not just locally, but globally.

I suspect that a large part of that 25 per cent of the traffic on the cellular system that is data is going to be messaging. The cellular network will become a major carrier of email. Email lets you stay in touch but doesn't force you to reply instantly the way a phone does.

What else can we deduce about the shape of communications to come? Well, the network to which we will connect will probably be very much like a new world. The model for this already exists in the Internet. Just like a new world, the Internet is impossible to characterise, for it is just too diverse. It contains everything from the esoteric communications of astronomers to an online country club populated by fictitious grande dames that are really aliases for young male homosexuals.

There is no reason to think that the Internet won't form the basis for this network — it is already the largest in the world and is growing exponentially.

This network (or Internet) of the future will be just as diverse as any of our cities today. For certain, it will have its poor quarters, its rich quarters, its criminals and its police.

Observers often call this the cyberspace. Cyberspace is a metaphor for the environment inside such a network. But it would be a mistake to think that it is a separate reality. In just the same way as our interaction with all forms of communication is moderated by our 'real' lives, so too will normal reality overpower the illusion of cyberspace.



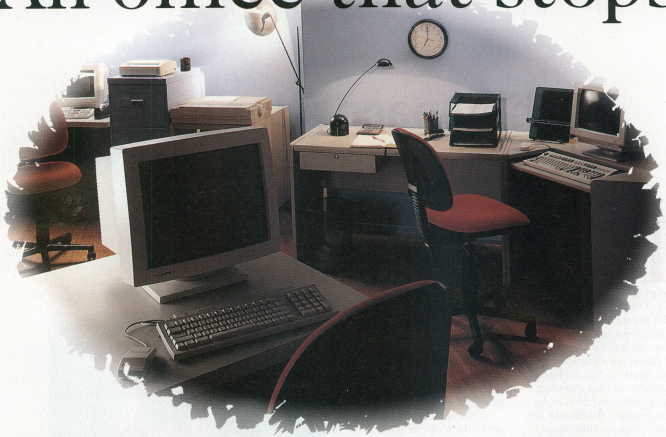
The richness envisioned in William Gibson's cyberspace is still very far in the future. We can see a hundredfold or even two-hundredfold increase in computing power by the end of the decade. However, to create the real-time simulation of a world that could come close to matching the reality of our real world will take much more computing power.

We have seen in *Jurassic Park* a simulation created by computer of a living being. This single-sense simulation took a lot of computing power. It is currently beyond us to create an interactive real-time simulation (that is without drawing on pre-created sequences).

Add the full three-dimensional world with sounds, smells and touch, and you have a problem that is still a long way from solution.

So what we can see in the near future for communications is a net spread across the world providing some sort of path to link everybody with access to a computer. It will often support interactive video conferencing but will be a long way from virtual reality.

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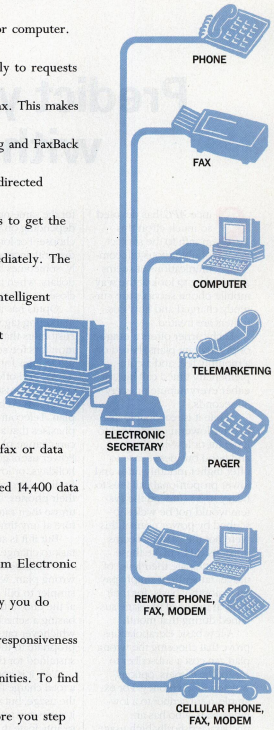
By now we may have raised a lot more questions than we've answered, so let's take things one step at a time.

The Electronic Secretary connects to your PC (IBM compatible) and includes NetComm's Cooee Communications Software so you can program it via your PC and personalise it with your voice. You'll find setting up is straightforward.

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It also replies automatically to requests for information via voice or fax. This makes it invaluable for telemarketing and FaxBack applications. Callers can be directed to select a variety of options to get the information they want immediately. The Electronic Secretary is also intelligent enough to identify whether it is receiving a fax, phone or data call and will switch automatically from voice to fax or data mode. And it's a fully featured 14,400 data and fax modem as well.

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Words At Work NET 029

Predict your phone usage with a crystal ball

Since *APC* has devoted so much effort this month to the subject of ubiquitous telecommunications, it seems appropriate to look at the way mobile phone services are currently charged and how customers are treated.

Each carrier offers a range of pricing rate plans, based on a monthly fee, and a complementary timed call rate, at either every minute or every 30 seconds.

While it is reasonable just to offer lower monthly fees to itinerant or low-level users, and good business sense to offer higher monthly rates and lower proportional call fees to heavy users (indeed the system would not be well subscribed by power users if this were not the case), it seems nonsensical to make these users anticipate their level of usage, rather than simply pay, on a monthly basis, for their calls, at the level of usage sustained during that month.

A few basic extrapolations prove that choosing the wrong plan can cost a subscriber to *any* of the carriers' options, way too much money. For example, a subscriber to a low-range plan, who has an uncharacteristically high usage month, will be charged at the higher call rate for each of those calls. At 48 calls per month, each averaging one minute, subscribers to the Optus service might pay an estimated $61.30 instead of the optimum rate of $53.90 for the same number of calls. Telecom 018 subscribers might pay a projected $70.99 instead of the optimum $57.47, and Vodafone customers could pay anything from $74.28 to $54.85 for the same number of calls, depending on which plan they choose. For longer calls, the disparity increases dramatically, sometimes by hundreds of dollars, when the call time is closer to 10 minutes.

Optus has a wonderful marketing tag which assures customers that it constantly monitors fee schedules and usage rates for every customer, and offers advice if it sees that a customer could be better served by an alternate plan. Telecom also emphasises that any customer can change plans at any time. Power users going on holidays, or lower-level users finding a growing reliance on their phones, can thus optimise their rate and call structure at any time.

But if it is such a simple task to change subscribers who find themselves on the wrong plan, why is it not then simpler to bill each subscriber at the end of the month, basing a scheduling fee on whichever rate plan is appropriate to the level of usage sustained for that month?

Yes, it is appropriate to set a total charge for the value of the usage, but why on earth is it necessary to ask customers to anticipate that level of usage in advance? Vodafone's Bruce Wren asserts that choosing the rate plan appropriate to each customer is the task of the company's trained staff, and that nobody goes into the process of selecting a phone plan unwittingly or without considering the options. Telecom MobileNet staff argued that Austel regulations prevented the carrier from billing retrospectively, and that in any case it would be an administrative nightmare. Ian Slattery, Austel's director for Competitive Policy denies that such restrictions are in force. Provided the carriers file their tariffs with Austel, any carrier can change a customer between rate plans as long as the customer agrees, as often as required. It is not a matter of regulation, he says, it's a purely commercial decision. Oops.

We choose stationery phones every day. We know that the phone is part of the rental plan, that every month we pay a fee for the right to use the phone. We make set price local calls, higher priced long distance calls, expect reductions on these for calling in the middle of the night or if we are blessed by having friends or family to call, safe in the knowledge that at the end of the month, or quarter, we will be billed according to the number of calls, and time spent on the phone. We don't expect a 'rebate' for making lots of calls, and the rental plan is low enough to accommodate even occasional users. Nobody expects us to anticipate how many long distance, midday extended conversations we're going to make from the home phone. When we are talking about beaming satellite broadcasts to television sets all over the world, and bringing enough data across a telephone system to provide a video on demand, why isn't billing technology sophisticated enough yet to offer us the same flexibility on the fly?



BY HELEN DANCER

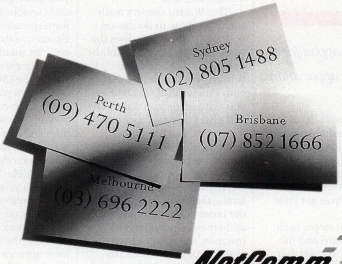
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Someone's in my software

Computers are supposed to make things easier, right? Then why do we spend so much time figuring out how to run each and every piece of software that we load on our computers? A relatively new concept may make things easier. Many of today's best new software packages are trying to be much more than just tools.



BY MICHAEL MILLER

You may be tempted to polish some apples for the helping hands in your applications.

They are designed to be wizards, experts, advisors, coaches and tutors.

Many of the new programs that come across my desk feature one or more of these software teachers. And like teachers in a classroom, they can show you how to perform a task. Unlike teachers, they are just as ready to do it for you (in some cases, even the speed of performance is at your discretion). In almost every case, these electronic educators go a lot farther than the online tutorials and help systems to which we're accustomed. But like real teachers, they do have their own personalities. Almost every software developer has its own name for these advanced help systems. And each one of these instructors works differently from the others. All of this tells you a lot about the orientation of both the developer and the program.

Microsoft sparked the trend with a series of Wizards that came with Microsoft Publisher 1.0, Microsoft Excel for Windows 4.0, and Microsoft Access. Eschewing the step-by-step tools approach found in most software, Wizards take a more task-oriented path to helping you get your work done.

The first such steps, such as the Chart Wizard and the Crosstab Report Wizard that come with Microsoft Excel 4.0, have been somewhat tentative. These Wizards take a fairly simple, straightforward task — creating a chart or crosstab — and do it for you. For instance, the Chart Wizard asks you to select a range, select a chart type, and answer a variety of other questions. Then it creates the chart for you. It does not really teach you how to use the menus and commands in the program; it just assumes you have a job to do, and so it helps you out.

These Wizards have since become more sophisitcated. In Publisher 2.0, you choose from multiple Page Wizard Assistants that let you set up your document as a banner, business card, greeting card, newsletter, brochure, and so forth. These are much more than just templates. The Wizard gives you numerous choices such as overall design, placement of pictures and page orientation, and then it creates the document for you. Dummy illustrations and text are also added, which double as instructions. For example, 'This is the front cover' appears on the first page of your brochure and also serves as a dummy title text.

This Wizard doesn't really teach you how to do this on your own, but it sure does the work for you. Here in Publisher 2.0, and in Access, the Wizards are supplemented with Cue Cards that can, if you choose, remain onscreen and give you tips about what to do next. But for the basic functions, the approach is simple: sit back and let the Wizard do its magic.

Actually, the more you examine these digital teachers, the more you realise how aptly they've been named. For instance, the fundamental differences between a wizard and coach in 'real' life parallel the differences in software. Wizards wave a wand and make things happen; coaches support you in your own efforts. WordPerfect has taken the latter approach and added a series of Coaches in WordPerfect 6.0 for DOS to the help functions, using native WordPerfect commands to teach you how to do various tasks yourself — just like a real coach. Tasks range from the simple — making a text boldfaced — to the more complex — inserting hypertext links or making a table of contents. Each Coach walks you through the process of doing a task using your own data and WordPerfect commands.

For example, a Coach will walk you through the steps of marking text in your document for inclusion in a table of contents and then selecting the proper commands for creating the table. In many cases, these Coaches give you the option of letting them do the work for you or showing you how to do it. In the upcoming Quattro Pro for Windows 5.0, Borland International goes a step further, including both Experts and Tutors in the program.

Like Wizard, Experts help you create graphics, scenarios, and consolidations, and perform spreadsheet analysis. But Experts, as the name implies, are a bit smarter then Coaches, Tutors or even Wizards. For instance, the Chart Experts not only walks you through the steps and creates a chart for you, it lets you add things like titles and axis labels along the way. At the same time, it shows exactly what the chart will look like before being placed in your spreadsheet. Like the real experts we so often rely on, the Expert even offers you an option of letting it choose the graph it thinks most appropriate for your data. I'm especially impressed by how easy the Analysis Experts make some often confusing functions, such as correlations between sets of variables.

Continued on page 55

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Style and focus in software suites

Which is more important to you: programs that work better together, or programs that help you work better with your co-workers? That's the choice you make these days when you buy a software suite.



BY JIM SEYMOUR

Today's application suites make users choose between better software links and better team communication.

Failure to understand that difference, and how it has arisen, can lead to an expensive and frustrating mistake in choosing the right suite for you, your co-workers, and others for whom you may be recommending or buying software.

The boom in the software suite business has been the biggest change, in the PC applications software business over the past year and a half. Aggressive pricing by Microsoft and Lotus, the two dominant suite makers, has driven down the cost of the individual applications included in a typical suite package. At less than $150 per app, the heavily discounted package-deal suite is still the way to go, even if you want only a couple of the five programs in Microsoft's Office Professional or Lotus' SmartSuite. (The economics of the shotgun-marriage bundle of Windows versions of Quattro Pro, Paradox and WordPerfect — a very distant third in suite sales — aren't so clear, though that package can be a good buy, too).

Buyers obviously agree: suites now constitute about half the applications sold by Microsoft, somewhat less at Lotus. Microsoft pocketed more than a billion dollars from Office over the past year.

The contest between the two companies in the suite business is rough, and has been one-sided, with Microsoft outselling Lotus by about four to one. But the appearance of 1-2-3, Release 4, in SmartSuite a few months ago began to change that. The other applications in the bundles have been at rough parity for some time, but 1-2-3 for Windows lagged behind Excel. The new release of 1-2-3, however, brought SmartSuite into a close tie with Microsoft — so much that smart buyers began to look beyond head-to-head evaluations of the individual applications in the two suites, toward broader issues of style and approach.

Programs vs people

And that's where buyers got into the question of which should work together better — programs or people.

That sounds like a loaded question. But don't think I'm being critical of packages that do more to get programs working together than to bring people together. In many cases, tighter program integration is more important to PC users than peer-to-peer work-sharing links to co-workers.

There are really three trends at work here, not just those two. Microsoft, Lotus, Borland and WordPerfect are all also trying to improve their individual applications, as well as their suites' connections. Standalone sales of individual apps remain immensely profitable, and no company near the top of the PC business is about to slack off on improving its applications. But it's increasingly easy to see that software suites are greater than the sum of their parts.

That is, the integration among the apps — the 'glue', so to speak — is a critical part of the value added by the suite. Bargain prices built the suite business, but the quality of the glue in suites is coming to be as important as the quality of the individual applications. And the directions taken by Lotus and Microsoft in creating and applying that glue are very different.

Microsoft is a killer-code shop. Everything about the company and its culture, from Access project-leader Dave Cutler's fist-through-the-wall outbursts, to Excel programmers' weekly round of golf in the hallways, to Bill Gates' intense sessions with developers, to the company's employee-incentive programs, focuses on turning out great code.

That focus delivers killer apps — and for software-suite glue, apps that work with other Microsoft applications in rich and surprising ways. The new Office Professional, Version 4.0, hints at that with a beefed-up Word for Windows; the free upgrades of Excel and PowerPoint, due shortly, make even more clear

Continued on page 55

MICHAEL MILLER

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The Experts do things for you, but Quattro Pro also comes with Interactive Tutors. These are the computer-based tutorials we're accustomed to seeing, showing how to do all the basics with a program's normal command. Yet these introduce a major twist: they let you work with actual data in your spreadsheet, making it easier to learn how to use a program while actually getting work done. (And if there's a mistake, you just go back to where you were before starting the Tutor.)

Of course, there are things you need to know when you're using software that don't really pertain to the software itself. That's something Software Publishing Corporation was clearly responding to when it created the Advisor in its new Harvard Graphics 2.0 for Windows. The Advisor, which optionally stays onscreen while you're working on a presentation, can display 'Quick Tips' showing how to perform the most common tasks with the software. But it can also provide 'Design Tips' showing how to make a better, more effective presentation. For instance, if you're editing a bullet chart, it will advise you to 'use few words' and 'avoid ALL CAPS' because they are harder to read. I've certainly seen enough examples of presentations gone amok to appreciate this. Not only do people need help in learning to use presentation packages, they usually need some good advice on creating better presentations.

Advisors, experts, tutors, coaches and wizards: it sounds like the faculty of a great school. And why not? New computer programs are getting very sophisticated, but the point of computers is to make life easier. With these various teachers training us, and sometimes doing a bit of our grunt work as well, we might have more time to play hooky.

JIM SEYMOUR

Continued from page 54

Microsoft's commitment to programs that work well together.

Lotus, on the other hand, has been repositioning itself for the future using the communications links of Notes as its core product. By building Notes linkage into every SmartSuite application, Lotus is revving that package around the notion of programs that help *people* work together. For those workers who live in Notes — essentially a big, rich database — the links to the SmartSuite applications are dazzling. With this new suite, Lotus is finally delivering on its workgroup-computing promises on the applications level.

The *leitmotif* of SmartSuite is now interpersonal communication, while the theme of Microsoft Office is interprocess communication.

Convergence ahead

Fortunately, these divergent paths will probably converge in a couple of years. Much of the interprogram linking and flexibility of the new Office apps comes from Object Linking and Embedding (OLE) 2.0.

A year ago, a Microsoft programmer working on the then-unreleased OLE 2.0 told me it would be a year before Microsoft's applications programmers understood it, and even longer before other companies did. He was right, but rich OLE 2.0 implementations will be appearing shortly from Lotus and others, too. We'll see lots of programs benefiting from that kind of connection. Similarly, Notes is becoming a kind of meta-glue for external applications, as Microsoft and others develop links to the Notes API.

Today, you still have to choose between programs that work better together and programs that help people work better together. In another year or two, that distinction may have disappeared.

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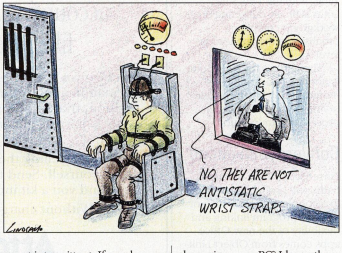
Zapped

For the vendors who sold Jeremy Torr the new hard disk drives for his article 'Making the right choice', published in the October 1993 edition of *PC Super Market*, I hope they are *making the right choice* and not offering him any sort of warranty. His installation technique leaves something to be desired.

Mr Torr starts off by saying: "switch off the PC," very good electricity hurts, "then disconnect from the mains." To be sure of safety, "use an anti-static wrist strap" — which he forgot to tell you connects to a non-painted part of the PC chassis, that is, the power supply, after checking it is not live, by touching it with the back of the hand.

Now here is the problem. The anti-static wrist strap makes the electical potential of the two items the same (the person and the computer). So by unplugging the PC from the mains there is no earth for the static charge to be transported away on. What then happens is that Mr Torr has become an arc welder and most likely causes unseen damage to the chips and components on the drive, but also in the PC. Circuit boards make a great way to pass around an electic charge, causing untold damage to unsuspecting components; this will make the PC or componentat at best dead, or at worst intermittent. If you happen to leave the mains connected, the other lie propagated by Mr Torr is the one of touching the power supply and you are okay is also untrue. The moment you release the power supply you start a fresh charge of static electricity looking for an exit point — your computer. This method will only work if you hold onto the power supply for the complete period of working on the PC, making it very hard to actually do anything. This is a problem the whole PC environment suffers from. In the mainframe and mini world a technician would be instantly sacked if he did not follow correct anti-static procedures. But how many times have you seen a PC technician open up a PC and board jockey with absolutely no anti-static protection . . . and more than likely damaging your PC? I hope the technician will provide free warranty for the rest of the life of the PC because future faults could be ones he has caused knowingly or otherwise.

Joshua Feek,
Wavell Heights, Qld



Mr Feek is absolutely correct when he says that an anti-static wrist strap is used to avoid static damage when dealing with electronic circuit boards or componentry. He is also correct when he says that if you connect it to the PC chassis when it is disconnected from the mains there is no effective earth for the PC/operator system.

However, Intel — who presumably knows what it is talking about when it comes to handling PC internals — says that simply touching the chassis prior to inserting a component (in their case the CPU) will give the same potential to both operator and PC works, and avoid static damage. Unless the operator rubs their feet vigorously on the carpet (if there is one) during the insertion procedure, no significant change in potential should occur.

As to being a human arc welder, I would suggest the best way to become one of these is to touch the power supply with the back of the hand to test if it is live. I don't do it, and I would strongly recommend readers not to use this technique either.
Editors

A clouded objective

I was disappointed to see in the 'Cheap PCs' feature in October 1993 *APC*, how ADV fared in the comparison, a brand that I am proud to resell. I have sold ADV computers for three years now and feel I know the company's systems fairly well. When I saw the specification of the submitted machine and how it compared, I can understand the reaction it got from the testers. However, it seems a little insensitive on the testers' part to assume that this machine represents a '486DX/33 computer'. What exactly is that?

On talking to Harry and Vincent at ADV, their understanding was that 'low cost' was the prime objective, rather than ad-

ding most features to arrive at a retail price of $2999.99. With a possibility of features on a 486DX/33 computer of something like 18,562,000 combinations, a system with similar performance is easily configured. ADV's computer systems are assembled and pretested overnight in a hot and cold room, and their reliability has proven to be first class. They did not ask me to write this letter, I just wish to let my clients know that I believe that this result is not a fair indication of the way ADV computers compare in the market. It says in the article that "Vendors were encouraged to include other hardware and software while keeping the cost below $3000." This point was apparently not conveyed.

I run a consulting company and have been impressed with ADV, which really does support its dealers. I have priced a lot of computers from wholesalers who have retail arms, and usually find that it is cheaper to buy their cut-throat specials (retail) than at their dealer price. I would be happy to specify an ADV 486DX/33 computer equal to or better than the 'winning' brand, or better still, one that is best suited to my clients' needs.

Skip Hokin
MD, Actionware
Kilsyth, Vic

CompuServe Pacific charges accurate

I would like to respond to the letter from David Brown, published in the October edition of *APC*. Mr Brown felt that he had been misled by CompuServe and by the information provided in *APC*.

I can assure *APC* readers that the reduced CompuServe Pacific charges were accurately detailed in the August edition of the magazine. Jeremy White did an excellent job of clearly explaining the Australian dollar charges for CompuServe Pacific, including the network access charge of 25 cents per minute for connection to the CompuServe computers in the US.

The offer referred to by Mr Brown was a US promotion, included with a US-packaged terminal emulator. It explained the CompuServe services (with charges listed in US dollars) and indicated that network charges applied in some countries (although there were none in Canada and the US). During the online sign-up procedure for CompuServe Pacific, Mr Brown was specifically advised that our rates may differ from those listed in any overseas offers and a complete listing of the Australian charges was provided. The CompuServe Information Service is now distributed and supported by authorised companies in many countries around the world including Hong Kong, Japan, Korea, Taiwan, South Africa, Israel, Hungary as well as Australia and New Zealand. Each country has its own charging structure and promotional offers. These offers are not necessarily transportable across national borders.

While Mr Brown may "feel cheated," he has been very fairly treated by CompuServe Pacific. He was not charged a monthly fee; he was not charged for connect time in basic services; and he received an introductory credit, providing around 80 minutes of network usage. As a further act of goodwill, we credited his account with over 65 per cent of incurred network charges.

Stuart W Broad, Manager, CompuServe Pacific

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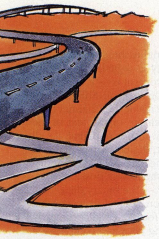
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Illustration by Louis Silvestro



The information superhighway

The rush to digital convergence has begun.

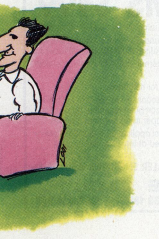


BY JEREMY WHITE



The information highway is a grand scheme in the traditional sense – a vast, sprawling interconnection of high-bandwidth digital networks, carrying voice, video and data, delivering the knowledge economy and new media forms like interactive TV and electronic publishing.

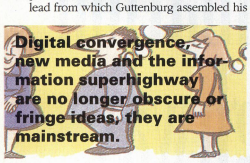
There is no single schemer, however. This is not an initiative driven by an individual with a vision, or a government with an agenda. It is a complex that will recast our communications systems, our media, and our daily lives. Its potential is generating more quiet but frenzied excitement than any other development in the last century, in this a century of marvels. Within months it has spread from boffin shops, management theory texts and committee reports, to dominate the business sections, and even the covers of daily papers like the *Australian Financial Review* and magazines like the *Economist and Business Week*.



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Digital convergence, new media and the information superhighway are no longer obscure or fringe ideas, they are mainstream. What we are seeing in the morass of confusing alliances, new technologies, reports, articles and theories is the equivalent of the pieces of wood, the screws, bolts and twisted lead from which Guttenburg assembled his



printing press. According to the visionaries, as they assemble themselves over the next handful of years, they will spark one of those revolutions that define human technological advancement, and change permanently the way that people interact, produce and sustain themselves.

The kind of words and predictions you'd expect from a giblet gazer or crystal ballerina? Yes, but ideas like these are emanating from the larynxes and keyboards of conservative business analysts and sober engineers.

The fervour, excitement and enthusiasm being generated are almost religious, reducing grown global media proprietors like Rupert Murdoch to evangelists for the cause; making wisened telecommunications executives behave like a gaggle of sexually naive but nonetheless promiscuous teenagers, hopping into bed with each other; and metamorphosing the cold-faced numbers men heading technology leaders like Hewlett-Packard, Apple and Intel into starry-eyed visionaries. Dollars are, of course, a part of the inspiration.

To many, this new age promises to make obsolete current theories of international economy, creating a knowledge economy, where knowledge, not capital, is the basis of wealth. For others, it promises to universalise knowledge, spawning a world in which all that is known and all that can be known is at the tips of your digits.

To some, it proffers freedom and rugged individualism, where anyone can go it alone — the Wild West of the information age. In its reliance on 'coopetition' and its global nature, others still see the internationalisation of the world economy and the communalisation of the private sector.

For the control freak, it offers an infinite capacity to inspect and maintain surveillance of every human activity, and for the libertarian, complete freedom from the restrictions of corporations and government.

In its anarchy, some see the destruction of the potential for Big Brother — a vast sprawling interconnected network of niches, in the hands of no-one and beyond control. Others see it as an Orwellian nightmare's fulfilment, an all-pervasive network on which everyone is reliant, controlled by a limited oligopoly of the immensely rich and powerful, a network that, without access to which, you will cease to exist.

And for others, it is of no more significance than a tool that will let you play back phone messages on your computer, order pizzas with your TV, and play interactive Mario Brothers with a friend round the corner.

The digital age and the personal computer

In most articles dealing with the information highway you will see the term *convergence*. Although it sounds pretentious, convergence is a simple concept — coming together. In this case, the coming together is of the communications, media and computer industries. Often, the term will also be used to discuss the commodification or consumerisation of computer technology, but this is a symptom.

The shift from analogue to digital transmission of information is driving this convergence. Digital provides the common ground. If the signal rushing along the information highway is digital, it no longer matters what the content is — it might be a phone conversation or email, Shirl the Curl singing *Horror Movie* or the Channel Nine News, Stuart Littlemore or the text of the *Illawarra Mercury*. If they're digital, it's all just data. In effect, digital unifies different content forms at the highest level of sophistication by using the lowest possible common denominator — the binary digit.

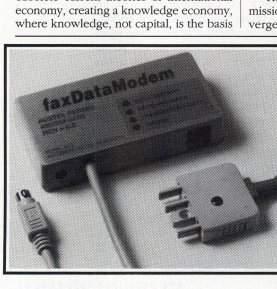
Once information is digital, a pipeline that can carry any one form of content can carry any other. Sampling rates and compression technology become the only restrictions. Your office network that carries database queries can carry the Simpsons, your phone line can carry your emails, your TV aerial can grab Ethernet packets. The PC will be at the core of new applications developed — the car on the information highway.

There are a multitude of issues that have yet to be resolved with these technologies, however. Most of the wonderful benefits discussed are blue-sky ideas. Unproven, untested, and many not designed.

In this series of feature articles, we attempt to provide an overview of an extremely complex and still unfurling field. The topic is one of buzzwords, and they're everywhere, but there is sense behind most, if not all of them.

In the first article, Helen Dancer provides an overview of how the information highway has come about as a result of converging technologies. We then examine the frenzy of alliances in the US, and to a degree here, and the claimed model that is driving them. Dan Tebbutt analyses the question of governing the information highway, comparing the initiatives in Australia and overseas. Helen Dancer than examines the technologies that will be used 'in the pipeline' to pump information into homes and offices.

In our last section, we examine the convergence of software — applications suites, Nazi-ware and the blurring of hardware and software — and we look at infotainment and interactive TV.



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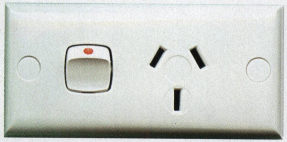
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"Optima is one of the five top local brands, and the fastest growing"
Australian Financial Times Monday, August 9, 1993

"A great debut by any standards, this local vendor is a serious contender for all-round top slot in the next year's survey."

".... 95.6 per cent of respondents said they would buy again"
Service & Reliability Report APC July 1992

Optima ... "leads the list of top risers by percentage"

"Optima's appearance marks 12 months of exceptional growth during which revenue rose an astounding 155 per cent"
The Computing 100, 1992

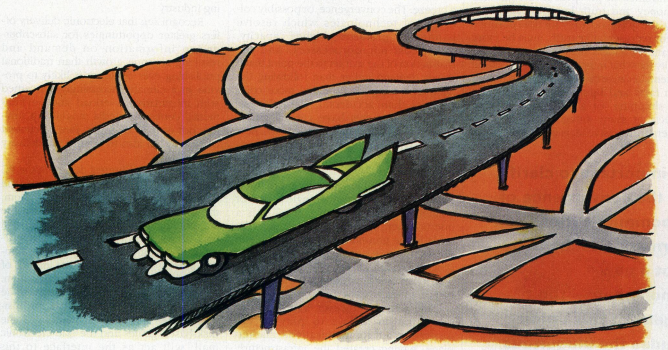
Optima Computer Technology's "Sprinter" is a solid above average performer
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The big picture

Hitch a ride on the digital data highway.

BY HELEN DANCER

In 1977, long before the advent of digitally altered images, American author, Susan Sontag, wrote that the consequences of lying must be more central for photography than for painting, since photographs make a claim to truth that no painting can ever make. This recognition of responsibility is equally valid in the broader medium which electronic delivery of digital data represents. Vast empires have been built around paper-based news services, motion pictures, video capture of these cinematic endeavours for the small screen, and wire-based and cellular delivery of telephone and telegraph services.

Now that technology has reached the point at which providers in each of these media can see avenues of opportunity from the convergence of one with another, powerful vested interests come into play not only to protect existing influence and market share, but to do everything possible to carve out a sizeable slice of the future.

And since the prospect of vast amounts of money and truth keep uneasy company, the quest, not only for little portions but for representative truth, must be more vigilant. Providers must assume responsibility for what must generically be called content, because the spectrum is so broad, from facts and figures to entertainment and shopping, or a complex fusion of aspects of many categories. Alert consumers and incisive legislation will ensure

It is important to clarify that the convergence of telecommunications and information technology is not a new phenomenon — the progeny of this union includes the ubiquitous fax machine and the widespread use of inter-office electronic mail.

that more than lip service is paid in the battle for delivery mechanisms to provide valuable content and for content providers trying to deliver.

It is important to clarify that the convergence of telecommunications and information technology is not a new phenomenon — the progeny of this union includes the ubiquitous fax machine and the widespread use of inter-office electronic mail.

The gathering momentum behind the technobabble however, is the maturation to a critical point, combined with the impact of the convergence of these two technologies with the wider information providers and entertainment industries — publishing, television, cinema, video — with a broader range of product aimed diversely at business, education and consumer markets.

It is the entry of this third dimension which will have the greatest impact on the consumer marketplace, and since it represents more 'bums on seats', it also represents a quantum increase in the dollars in the pocket — new revenue streams for presenting the same information in radically different ways.

Delivery over cabling and switching systems of a wide range from information-on-demand services, filtered news, education and recreational programmes is technically a breeze. The convergence, or possibly collision, of technologies which resolve bandwidth problems, higher capacity, lower-cost microprocessors, and the maturation of the market to the point that it drives demand rather than following the 'next best thing', is probably more coincidental than accidental. Nevertheless, such developments have created an incubator from which new partnerships, new technological processes, and new incidents of convergence are hatching at an increasingly rapid rate.

Fibre-optic cable will carry more information faster than any one single person or community could possibly need. It is a question then, of logistics, of how to get the cable in the ground to the most people in the shortest space of time, and at the lowest cost. There are alternatives, which come with lower cost structures and performance compromises.

Telecom, or however many carriers deregulation allows to play in the Australian telecommunications marketplace, having created the infrastructure, then has the power to control delivery. There are two major components to this aspect of the convergence phenomenon — control over the delivery mechanism, and control over the content. And therein, lies the political responsibility — that the best interests of all parties may be best served by keeping the control over these elements separated.

Those who would be major players in the new technology environment are well known, but drawn from backgrounds not directly associated with technological innovation since Guttenberg — the publishing industry.

Recognising that electronic delivery offers greater opportunities for subscriber-driven information on demand and resulting revenue growth than traditional publishing ever could, or is likely to provide in a climate increasingly concerned with information overload and environmental concerns, media moguls are striving, not only to be at the fore of content provision, but also to control the delivery mechanism.

And while the hottest debate in the PC industry over the last 10 years has been the choice of platform and operating system, the digital delivery of data across cable straight into the office and home, will make the issue of 'which PC' largely irrelevant, in much the same way that no-one currently asks to know the innards of their television, video or stereo system. Ubiquitous access is the key, the machine we currently call a PC, and use for business chores and home accounting, some disk-based games and the odd electronic mail, will act as the interface to this delivery pipeline. But the brand, the operating system and even the form it takes will be largely academic to the issue of getting the data into the house.

The chip is the thing, Intel tells us. While freely admitting that not even Intel knows exactly how the industry will shake out, indeed only a savant or an idiot would be prepared to stake an opinion at this stage of the game, managing director in Australia, Geoff Healey, asserts that Intel is well placed to be at the hub of the new structure. To complement its core products, the microprocessor chips inside a large proportion of the world's population of PCs, Intel has diversified in the directions signalled by the revolution in delivery — desktop video and network management products.



Accordng to Geoff Healey, general manager of Intel Australia, Intel is well placed to be at the hub of new technology because its microprocessor chips are inside a large proportion of the world's population of PCs and the company has diversified into desktop video and network management products

At the core, then, is sophisticated microprocessor technology, married to faster, smoother communications.

The result is a data highway upon which, in an ideal world, we will all be able to travel, as providers and consumers.

The road has no end, and though we will all consume information, each incidence of information used is no longer an end product, but another step in the value chain.

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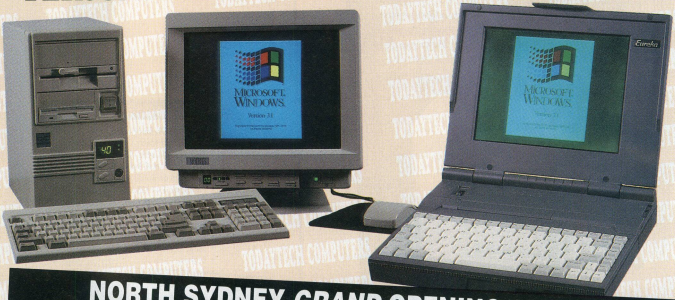
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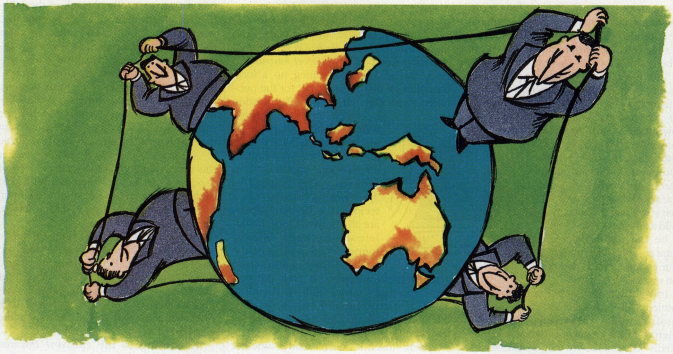
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Companies to watch

Who's gambling on digital convergence.

BY JEREMY WHITE

A series of mergers and alliances are putting in place the corporate structures necessary to build the information superhighways that, according to proponents, will carry us into the next century. In this part of the feature, we look at who is involved in these alliances, what is driving them, and what their likely results will be. There is no asphalt on the information superhighway. No concrete laid, no barriers drawn, no graders or earth movers in sight. There are some old country roads nearby running roughly in the course of the new venture, but the surveying has yet to be done, and plans yet to be drawn.

The tollgates, however, are already being built. The information superhighway will be remembered as the first road ever where the tollgates were built first, and the plans and construction started only after they were finished.

The information superhighway is too big and complex for any one company, or even industry to handle. Instead, the private sector says it is relying on cooperation and strategic alliances, almost entente, to produce the necessary new technologies and infrastructure. If they succeed, and cooperation and public good come out ahead of individual greed and monopolistic or oligarchic tendencies on the part of many involved, the result will be the first truly massive infrastructure project inspired and completed by private interests. It will be a global entity.

Companies are positioning themselves now with mergers and alliances for a series of ventures that not only won't be profitable for a decade or more, but which as yet have no solid form, and could possibly turn out to be nothing more than hype.

The reason they are moving now is that the money made from these new information highways won't be generated by selling the products that will travel down them; it will be made from owning a part of the road system itself. If you're not already in a position to make your dollars when the red tape across the highway is cut, then you'll pay excessively to build a tollgate at a later stage, or be faced with the exorbitant cost of paying to freight your goods down a road system owned by others.



Irrespective of whether companies are dominant in local markets, small but successful niche operations, or global enterprises, they can't afford to act disinterestedly. These alliances will, of themselves, recast markets. The technologies they aim to create, if they eventuate, will also completely change notions of distribution and communications.

Currently, consumer electronics, broadcast and print media, telecommunications and computer industries are all perceived as distinct. You'd no more think of buying your morning newspaper from Optus than you would of using your clock radio to make a phone call. The time on a clock radio, a phone conversation, a movie or a computer game are all just forms of information, though — they're different forms of content. You might even say they're software.

At the moment, these different forms of content each require different production and distribution systems. If you buy a magazine like the *Bulletin*, it comes in an A4 glossy-paged form. To produce and distribute such a magazine, you need to pay for the paper and the printing, and then the costs of shifting the end product to a newsagent or shopfront where it will sell, or via the postal system to subscribers. You need to pay for the infrastructure necessary to enable all these things.

The costs involved are significant. Similarly with a newspaper. As Rupert Murdoch noted in an interview with Terry McCrann in his *Telegraph Mirror*, "Newspapers are protected, they take quite a lot of capital to start and then they take a lot of money . . . to distribute."

The same applies for a telecommunications company or broadcast media. Optus, for example, relies on Telecom's existing network to reach most homes and offices because it has no choice. Channel 9 doesn't have to worry about another broadcast channel entering the market because the costs for a new entrant are prohibitive.

The distribution issues also mean that local companies have an advantage. The *Australian Financial Review* is safe from a potential Australian *Wall Street Journal* because it's unlikely that setting up a local operation would be profitable for the publishers. With digitisation, the differentiation between different content forms dissipates. Everything is reduced to the binary digit, the bit. A phone conversation, a networking packet, a video conference, Elvis singing *Love Me Tender* and the text of a recipe in the *Women's Weekly* are all just data. Once the differences between different forms of content are gone, the need for different distribution systems also disappears. If your pay-per-view movies, phone calls and online database searches are all at base binary data, then they can all run across the same cables and wiring.

For the user, it doesn't matter whether this digital information is transmitted via satellite, by radio transmission, over fibre-optic cable, or copper wires. Similarly, if it's digital, the one component of receiving hardware should be able to manage it all — the ultimate consumer computer.

Convergence

For the companies involved, though, the difference is critical. The communications system becomes the distribution system for published content, whether that content is a video clip or news story.

The frenzy of alliances we have seen over the last six months represents the coming together — the buzzword is convergence — of three sectors; content, communications and computers.

The content is what people want, the communications system carries the content, and computer technology manages both its generation and reception.

This convergence does not mean that companies in these sectors lose their identities. Instead, the basic activities which companies perform well — their so-called core competencies — become paramount. Companies with different skills combine in business groups, either through alliances, mergers or cross-investment, to work on projects that are too complex for any single company to manage. This idea is not new. The Japanese have tight-knit business groups called kereitsus that work on a similar basis, and NEC foresaw convergence 20 years ago.

The idea in this case is that these groups form constellations with each other, each producing different sections of the information highway. Some provide the content that runs over it, others produce the high-bandwidth communications equipment to pump the data along, and others produce the computer equipment to generate, distribute, receive and manage the information flowing out across the ether tollways.

Because all forms of information are digital, and share the same global distribution system, owning a part of the revenue stream created becomes more important than buying or selling individual products.

Apple's CEO, Michael Spindler, earlier this year compared Lotus selling a copy of 1-2-3 as a one-off to a customer for $25 to his cable TV company back home charging $60 a month to lots of people for a service they never watched.

Companies with a stake in the revenue downstream — Spindler used a food-chain analogy — are both customers and providers. The Securities Commission, for example, might publish company information, while also receiving news feeds, stock market reports and so on. Customers are also part of the 'value constellations'.

According to the *Harvard Business Review*'s Richard Normann and Rafael Ramirez, "in a world where value occurs not in chains but in complex constellations, the goal of business is not so much to make or do something of value for customers as it is to mobilise customers to make value for themselves. That is why ATMs are so popular despite the critics. And that is why IKEA has become the world's largest furniture retailer." There is potentially an unlimited supply of information going to be available out there on 'the net', and anyone should be able to access it, thereby creating value for themselves. The PC will be the tool that allows the consumer to access it, or so the theory runs.

Normann and Ramirez argue that what is true for individual offerings is true for whole systems. "As potential offerings become more complex and varied, so do the relationships necessary to produce them. A single company rarely provides everything anymore."

US background

The state of the telecommunications system in the US has accelerated whatever impetus there might otherwise have been for the adoption of this model.

In many ways, the US paralleled Australia's current system, with a dominant carrier to which competition was introduced. MCI, the upstart, brought an antitrust suit against the dominant AT&T which resulted in the creation of the Baby Bells. AT&T remained a long-distance carrier, but it was cut off from regional local markets, which were catered to by the Bells, and has been paying $US14 billion

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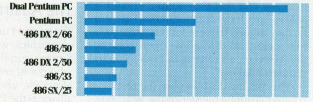
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dollars annually for access to their customers.

This tended to entrench monopolies as the natural delivery system on a local level for the majority of American citizens. This trend continued with the popularisation of cable TV. Cable providers likewise adopted local regions with monopoly status.

This meant that, while they may have had a choice, as we do, for long-distance calls, for the bulk of their communications US citizens had a choice of one local phone company, and one local cable TV company.

With digital, though, cable companies started experimenting with sending communications services down their existing pipes into the home, while telecommunications companies experimented with sending movies down.

Who's leading the way

AT&T's CEO, Robert Allen, has said in an interview with the *Washington Post* that the grand-daddy of US telecommunications is not interested in cable TV companies as a method of bypassing the Bells to access local markets and avoid their large access fees. He has said, however, that the company is watching mergers with interest. "We are placing bets in a number of areas," Allen said. "Because we don't know exactly what the future looks like, we want to learn about it in joint ventures, investments, partnerships and trials."

One such investment was a $US12.6 billion buyout of McCaw Cellular Communications. Wireless communications are touted by AT&T as a big growth area, particularly Personal Communications Services, where a phone number 'follows' a user from a home phone to office to mobile automatically. Another investment of note was a 20 per cent equity in the Sierra Network (of Leisure Suit Larry fame), and the company has said it is also interested in online services.

The McCaw Cellular deal raised an amount of ire in the US, and some of the Bells argued that it was clear long-distance carriers were going to be able to access local markets through these sorts of mergers, and that they in turn should be able to carry long-distance traffic. Essentially, they argued that the industry should be fully deregulated to allow open competition between all carriers in both local and distance markets.

The McCaw deal was not the first large communications merger of the year, however, nor has it raised the most ire.

Traditionally, most US analysts had assumed that as technology improved, the Bells and cable TV carriers would be pitted against each other for local markets. What has in fact happened is the teaming of cable TV companies from one region with phone companies from another, providing extended access for both, as well as diversified access to content.

The first of these was the announcement in May that US West would invest $US2.5 billion in Time Warner Cable TV and Warner Bros. $US1 billion of this was to go towards research for the information highway. They've since announced a $US5 billion upgrade of the Time Warner cable network.

This has since been dwarfed by the announcement of a buyout of the US's largest Cable TV operator, TCI, with 25 per cent of the cable market and access to 10 million homes, by Bell Atlantic for $US23 billion dollars, creating the sixth-largest corporation in the States with total resources of around $US60 billion, and access to 42 per cent of US households.

Bell Atlantic has already won the right to send video services into its 11 million customers' homes, and is planning the implementation of an interactive TV trial. TCI had announced in April that it was spending $US2 billion to install fibre-optic cabling into homes.

This has made another buyout more interesting still. TCI was behind a bid by ex-Murdoch employee Barry Diller's QVC Home Shopping network for Paramount, of which he is also an ex-studio boss. To complicate matters, this $US9.5 billion dollar move was to outdo a $US7.5 billion move for Paramount to merge with Sumner Redstone's Viacom, which in turn had announced that another Baby Bell, Nynex, was investing $US1.2 billion in it.

The moves by Bell phone companies to buy into cable companies are also an acknowledgment that the technology used by the cable operators, usually switched fibre networks, is superior to their own, which is generally still copper based.

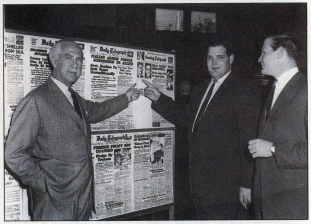
The Australian scene

There aren't many Australian individuals or companies who can deal in the billion figures common in convergence. Three who could are Mr Kerry Packer, Mr Rupert Murdoch, and Telecom. Their own brief alliance (the PMT consortium) to bid for an Australian Pay TV licence ended without anyone really noticing, at least if an interview by Business Editor, Mark Westfield, with Murdoch in the *Australian* is anything to go by:

"Asked whether he planned any more ventures with Mr Kerry Packer and Telecom, Mr Murdoch said: 'No'."

Several local media reports since have quoted the PMT consortium as an ongoing venture beyond this. Of the three, companies relating to Packer's interests appear to have adopted a wait-and-see attitude. According to the *Financial Review*, Channel Nine is more reserved than Seven on the prospects for Interactive TV. Packer has, however, been quoted in the *Sydney Morning Herald* as saying that Channel Nine's interest in Fairfax was partly due to the trend towards convergence.

Murdoch has been less reserved, and although he has expressed cynicism that interactive TV and multimedia may be "all hype," he has positioned News Corporation in a series of alliances in keeping with the convergence model.



Mr Kerry Packer: Channel Nine's interest in Fairfax is partly due to convergence

In his interview with Mark Westfield Murdoch described the current glut of alliances as a feeding frenzy, but said: "This may be a window of opportunity to take a quantum step forward. We just want to be ready to do it should that opportunity arise."

Murdoch showed an early inkling for how technology could be used to revamp distribution when launching the *Australian*. The losses he sustained for 20 years waiting for it to make a profit were mirrored in a shorter time frame with the 50 per cent News Corp-owned Sky satellite TV venture with the BBC in Britain, which posted its first profit of $128 million in June.

Murdoch goes against the industry consensus that fibre is the superior delivery media for digital convergence. He sees satellite as being 'wireless cable', and argues that it is ideal for breaking the cable monopolies in the US. "No-one has tried seriously to get satellite into the home in America where there is cable . . . All the telephone companies are dying to try it because they have wires going into people's homes too."

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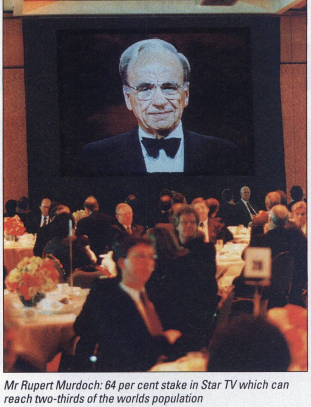
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News Corporation also had a role in the hostile bidding for Paramount between QVC and Viacom. The Paramount-Viacom deal was aimed in part at providing a rival to News.

Murdoch's most interesting venture, though, is the purchase of a 64 per cent stake through News Corporation in Star TV, a pan-Asian satellite service with the capacity to reach about two thirds of the world's population.

According to the *Sydney Morning Herald*, Murdoch's senior advisers discovered that Star's advertising revenues were significantly lower than expected after the purchase. Star has also been involved in a disagreement with the Hong Kong-based Wharf cable, which was to have screened some of Star's output until the change in management.

Nonetheless, Star currently reaches 11 million homes. News Corporation and Telecom are also evaluating a joint Asian phone service, providing audio information, such as news updates. Any phone service could eventually be a delivery mechanism for TV. Between the two possibilities and Asia's likely expansion and its population's increasing affluence over the next decade, Asia holds great potential.



Mr Rupert Murdoch: 64 per cent stake in Star TV which can reach two-thirds of the worlds population

The mechanism suggested by Murdoch to enable News Corporation to make the "quantum step forward" is the issue of Super Shares, which would abrogate the one-share one-vote principle, but allow News to raise $4 or $5 billion dollars and issue around 370 million shares without "diluting the voting rights of all the existing shareholders."

Murdoch has expressed interest in non-financial joint ventures with companies like AT&T as well as its studies with Telecom, although clearly the aim of the Super Share scheme is to raise capital by encouraging investment from a large telecommunications company without damaging his or other current shareholders' stakes.

Murdoch currently controls just under 33 per cent of News Corporation. He also holds a controlling interest in the huge US movie empire, Fox. News Corporation also holds a 15 per cent stake in the Seven Network, which in turn is also the subject of recent investment by Telecom.

Telecom, or Telstra as it's now known, is working as part of the international Telecommunications Intelligent Network Architecture (TINA) consortium towards the provision of a fibre-optic cable network with companies including British Telecom, NTT and AT&T.

Tenders to develop a cable TV network, which would need to be made available to all carriers, have been called for under the auspices of an umbrella company called Cable Constructions. 17 companies were listed for formal tender documents, including local companies, Lend Lease, Pacific Dunlop and AWA, as well as AT&T, EDS (the former Ross Perot company) and Continental Cablevision.

Telecom currently has pilot projects for cable TV — using a mix of fibre and coax cabling — underway in Centennial Park in Sydney, and also in Melbourne, and in conjunction with AWA and Siemens is trialling using existing copper wire for delivery, using asymmetric digital subscriber loop (ADSL).

The Great Australian Pay TV Debacle is interesting on a number of counts.

The ALP's Saunderson Inquiry in 1989 recommended using cable for Pay-TV, and that multipoint distribution services (MDS) should be used where cable wasn't feasible. After a series of amazing backflips, it has ended up that microwave services — which are gaining increasing industry support and a bulk of frequencies for which were snapped up by Steve Cosser — were banned for 10 years, largely without justification. MDS and cable were rejected and satellite was chosen.

Despite the farcical bid process in which initial rounds were fruitless, UCOM provides an interesting example of how the convergence model spreads all the way to Parramatta Road in Annandale, NSW. UCOM's chairman, Mr Albert Hadid, was supported in raising a deposit for the A and B pay-TV licences by Mr Gerry Lenfest, a US cable operator. A 50 per cent shareholder in Lenfest's is Liberty Media, which is, in turn, a subsidiary of TCI, which, as above, was bought recently by Bell Atlantic.

There is then potential for a US regional phone company to exercise eventual control of an Australian satellite pay-TV licence, while Telecom develops technology to send pay-TV down its existing copper-wire network off its fibre backbone, technology that by law would be open to any competitor with Telecom. MDS also now has a proponent — Cossers's Australis Media.

Another player is a Queensland family company, Rowcom Holdings, which was awarded 28 licences by the Australian Broadcasting Authority, and is looking to start up using cable via Telecom around 1995. Rowcom is the local face of US company Cox Cable. Two other Australian companies are planning a roll-out for interactive TV services; Sunshine and NTN Australia. NTN is starting with interactive trivia games in pubs, and Sunshine foresees a similar market when it starts in mid 1996.

Whatever the eventual delivery mechanism, and ideally it will be a deregulated combination of whatever works, US cable providers are also earnest to pump their wares down under. CNN executive, Mr Peter Vesey, told Channel Ten's *Meet the Press* in October that the news channel was ready to provide a service as soon as legislative and delivery issues were resolved. Other potential services include the BBC World Service and the Asia News Network.

Ironically, the global nature of the eventual services likely may lead to another form of convergence — the 1950's sociology sense of the word to mean the convergence and homogenising of different cultures.

Murdoch doesn't think so.

Computer companies

While the largest number of zeros after dollar signs are attracted to the media and telecommunications industries, the computer industry in many ways needs to play the most important role.

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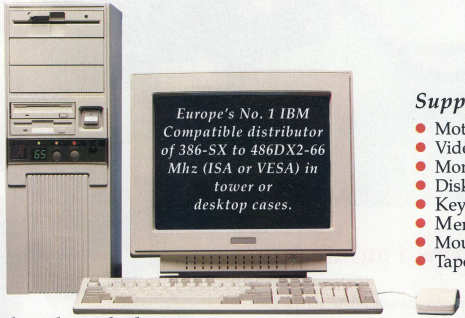
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Assuming the content and the delivery mechanisms required are in place, it is the computing industry that will determine the interfaces by which users access this content, and the form that information will take when it is published in new media.

Interactive TV and electronic news illustrate the problem.

Some of the touted services for interactive TV eventually include the ability to check online video libraries, and choose movies to watch from a catalogue. Other initial services mentioned include an 'Online TV Guide' or similar.

More advanced ideas include the ability while watching the news, to invoke related articles from a newspaper database, or check other stories on the same topic.

Reading online publications requires completely different metaphors to their paper-based cousins. You can't flick through a TV mag with the same ease you can the *Good Weekend* or *ABM*.

PCs are good at targeting information, not presenting it in an abstract or ephemeral, or even aesthetic fashion.

According the Compaq's Ian Penman, "The computer will become the engine or the kernel that drives this digital convergence."

It won't be a question necessarily of the PC as we see it now, however. More likely, specialist devices will be used that use computer technology and common interface systems, such as Windows, or the At Work implementation thereof, to drive specific tasks.

Rather than plugging your PC straight into the wall, your TV will initially have a 386 or similar plugged into it, controlling the interaction. A good example is the printer for interactive TV that Hewlett-Packard is designing, ready to download and print your customised newspaper or your favourite magazine columnists each morning.

PCTV services that appear when interactive TV first goes online won't be the be-all and end-all. They will likely be inferior and poorly implemented, limited to interactive game shows and shopping networks, and pay-per-view movies.

As the technology matures, and users become familiar with new metaphors and methods of using their appliances, so too will the products improve. The time will come when you will be able to check stock quotes while watching CNN, and scan through the *Illawarra Mercury* while watching *This Sporting Life*.

The computer industry is currently the silent partner in the convergence constellation. If it is to work, and the information highway ever be of real use to anyone, the computer industry needs to play a more active role.

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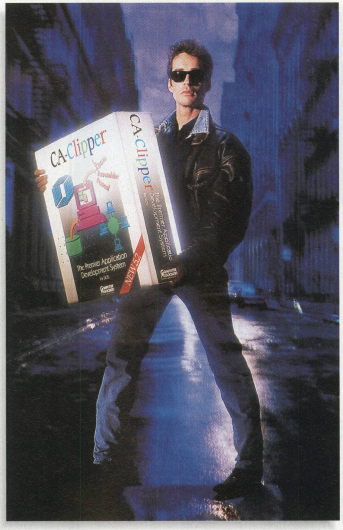
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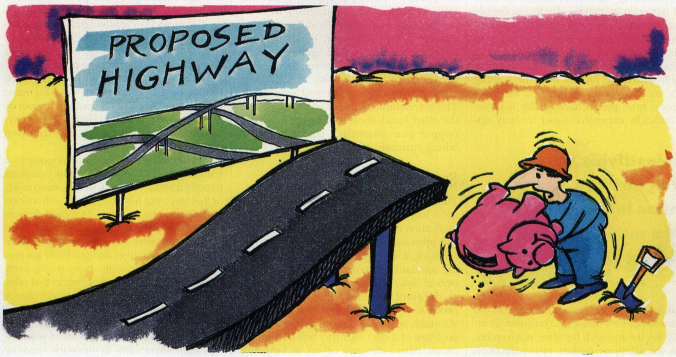
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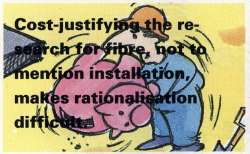
Bandwidth for the people.

BY HELEN DANCER

Rome wasn't built in a day, or so our grandmothers were fond of telling us two weeks before the start of the long summer holidays. And so it is with data highways, and yet they are the critical path to the new empowerment, the foundation upon which the myriad services and megabucks investors will depend. Business take-up is not enough, will never cost-justify the investment in infrastructure that is required for such data flow, and thus from this well springs the paradox of bandwidth for the people.

Success for the providers of both the technology and the available services hinges on providing access to the greatest number of people for the largest number of options, at the optimum price point – affordable yet profitable. Services therefore are just as strategic to the initial planning as the decision on type of cable and switching systems to be used. The paradox lies in not having the money to put in place an infrastructure capable of offering sufficiently attractive electronic delivery until after it has been established, and in generating a revenue stream from a growing subscriber base. Fundamentally then, it relies on being able to entice these subscribers in the numbers necessary to meet the initial return on investment.

Technology has rapidly caught up with, and has even overtaken, the technobabble of bandwidth; compression and decompression (CODEC) standards are beginning to take force; and by all accounts Australia's move towards a cohesive data highway should accelerate rapidly over the coming three to five years. There are a range of options, from the technologically feasible, but radically expensive super freeway options, such as laying fibre-optic cable to the doorway of every house and business. Cost-justifying the research for fibre, not to mention installation, makes rationalisation difficult even for the most enthusiastic economic-recovery-true-believer. Although fibre is the most evolved of the available technologies, some gaps in usability remain, such as the refining of an opto-electronic convertor, since fibre in itself is not capable of running an electric impulse to ring a telephone bell, rendering it an inappropriate telephone delivery mechanism.



Fibre/coaxial cable?

Longer term projects include a fibre/coaxial cable combination, involving fibre to the node, delivering services to the house or business in a star shape from that fibre, on coaxial cable, at a ratio of around 500 homes per node. While competing players offer very different estimates of the costs per customer of such a scheme, one thing is agreed: It will be a cost per installation rather than a cost per subscriber. When the infrastructure is rolled out, it will encompass every current telephone user, whether in a house, business or educational institution, gambling that a large percentage of these will choose to take up subscription services sooner rather than later. The risk of a low take-up rate, which would spell financial disaster, can only be offset by building a serious business case proving the value and range of the services which will follow.

The third proposed system, undergoing extensive trialling, is a fibre-optic/twisted copper pair wiring combination with ADSL (Asynchronous Digital Subscriber Loop) technology which, though still in experimental stages, holds promise as a cost-effective delivery mechanism, and one which has the advantage of being based on the existing installed telephony infrastructure. Lobbying for a preferred delivery mechanism is based on the different agendas emerging. Television companies are backing the fibre/coaxial option, because for them it represents a proven medium for delivering broadcast-quality transmission, and is at least a tried and tested technology. The telecommunications companies, on the other hand, seem to favour the twisted copper pair alternative because it uses wiring currently in place.

Standards

The ability to agree internationally on standards has speeded the process, with the ratification in March of the MPEG-2 standard for television-quality moving pictures. MPEG-1, which was agreed upon earlier, is the standard for moving pictures stored on optical disk. Manufacturers and researchers at different levels of the development process can now base further work on this standard, so that future steps towards the enabling of a data highway will be forward rather than sideways or off at tangents. Australia has made a significant contribution to the standard's foundation. Monash University in Victoria, in conjunction with Telecom Research Labs and Siemens, as the recipients of a generic DITARD grant for research, began what Siemens' Geoff Fagan calls some "abstract modelling which turned out to be red-hot property."

Red-hot copper wire

The principle of the research was to find out how little could be sent down to twisted copper pair wiring, which forms the basis of the telephone system currently in place, and yet still receive full television-quality movement. These studies, and the results derived from them, formed the basis of the MPEG-2 standard.

From these efforts was born the joint development project between Siemens and AWA which has seen the two successfully tender for the ADSL trial system, on a test site just outside Canberra. AWA in this instance is the prime contractor, providing the switching system, to link the subscriber line back to the source. Siemens is contributing its expertise in video compression, the key to carrying high-speed data on low-speed lines, such as twisted copper pair, aka telephone lines.

Siemens and AWA have been pursuing separate research for several years, according to Fagan, both aimed at refining the data rate possible on twisted pair. "Fibre (optic) to the home is incredibly expensive, therefore it is very tempting to see how close we can get to the home on twisted pair. The art form is to get that last kilometre to the house," he said. Now, of course, the average exchange to end-point distance is longer than this, but Fagan is optimistic.

The project is a series of trials designed to marry AWA's expertise in sending in the right frequency, a technology which Fagan describes as 'electronic ping-ponging' to establish the optimum bandwidth, with Siemens' ability to compress video for transmission, and apply a technology known as SDH, or Synchronous Digital Hierarchy, which allows smooth transition for data from high-speed to low-speed media.

The current situation is analogous to a roads and freeways system, in which cars can happily travel along back streets, main roads or freeways, but have no path to go from one traffic stream to the other. "A typical drive to work is not like that at all," says Fagan. "You start off at the kerb outside your house, drive along your own street and gradually get into the flow of traffic, onto busy roads, even freeways. So high-speed networks that offer no transition to low-speed networks cannot resolve the problem."

SDH technology will smooth the traffic flow, and will further help to deal with the quantum expansion in network capacity required to deal with the explosion of digits. Another aspect to the explosion in data traffic is that video on demand essentially requires a dedicated channel for each subscriber, so that each can access any program, at any time.

In total the ADSL trial, concerned with the transmission of bits over the wire, will refine a system for putting high-speed data onto low-speed lines — up to six Megabits per second. Outbound the signal is high-speed data, being the video broadcast or other service delivered to the home, while the return signal is low-speed, consisting of a 16K control channel to address the digital switch at the source, and a two-way telephone service. At six megabits per second the cable would be capable of simultaneously carrying a HDTV (high density television) broadcast, a video conference and an ISDN connection. The platform for the trial is AWANet, a system for taking the subscriber line back to the source, a technology which has been used in the field of air traffic control for some time.

The only advantage of twisted copper pair over the fibre/coax option is position rather than technological superiority — it is already generally in place. Telecom is on the verge of choosing among tenders for a fibre/coaxial trial, and Telecom's Chris Haigh asserts that for capital cities, with large numbers of people at short range, fibre/coaxial is likely to be the preferred option. For rapid mass deployment over longer distances however, where telephones are already installed, delivery via fibre-optic cable to an exchange or down a main street, with the data being transferred to and carried along the twisted pair copper wiring already in place, seems

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Taking to the air

Another option proposed by Optus is satellite delivery — naturally preferred by Australia's second carrier since it already has a satellite in place. Exploiting this strategic asset is, according to Optus business development director, Wayne Nowland, both a legislative right and a window of opportunity, which will necessarily narrow as technologies evolve. Nowland is quick to emphasise however, that Optus does not hold with the point of view that fibre-optic and coaxial cable won't have a place in the new TeleMedia scheme, but sees a realistic time frame as closer to between 2005 and 2020 than before the end of this decade. Compared to the technical and functional limitations of the proposed ADSL methodology, however, Nowland believes that satellite offers more. "The 10 [pay TV] channels committed in legislation are political restraints, not technical limitations. Satellite has the capacity to deliver six Megabits per second, something ADSL is still only aiming for."

Satellite can offer up to 16 VHS movies or two or three HDTV transmissions with any one transponder. Satellite, he said, will deliver a much more flexible video delivery mechanism, in its ability to time shift the same video up to 16 times during transmission, thus it can be programmed to start again every two minutes. It's not quite video on demand, he concedes, but a simplified system of offering greater choice at more convenience to the subscriber.

Satellite has the additional benefit of offering greater coverage, since with one satellite 'footprint' it can beam to an area covering most of the Australian seaboard. Inland, where the signal drops off rapidly, larger dishes are required, and Nowland says Optus can offer a simulcast capability, which will serve the bulk of customers in high capacity and the rest in normal beam. The additional cost of the simulcast capability will have to be met by the service providers, but he asserts that the numbers of new subscribers reached in this way and the revenue generated from these extra viewers will more than offset the additional cost.

Information in the hand

Ubiquitous delivery of information on demand also depends on the mobile network having the same capacity. Mobile demands for information, based on wireless technologies, may well be confined to voice and data transmissions, nevertheless, the mobile network must seamlessly interface with any in the ground or in the air infrastructure. In the US, the digital mobile standard CDPD (cellular digital packet data) has been set, while in Europe the GSM (global standard for mobile communications) standard applies. The differences between the two are not great. According to Retix's Mario Vecchio it is a typical political stand-off, akin to that between Unix and Windows NT. Australia seems likely to fall in line with the Europeans, and adopt GSM.



Satellite can offer up to 16 VHS movies or two or three HDTV transmissions

Into the 21st century

The system, in whatever form, will no doubt take a long and complex evolution, remaining heterogeneous well into the new century. New estates and building developments will benefit from fibre-optic installation from the ground up. The major cost of delivering fibre is in the installation, the carrying, rolling out and burying of the cable, so the extra cost to new building projects of laying fibre rather than the conventional twisted copper pair will not be substantial. Long-term it seems that whether it be subscriber-funded or amortised investment, the fibre-optic alternative will prevail, since it is the most technologically satisfactory, and the most evolved. Reading between the lines it is clear that Optus favours the satellite option as an interim measure, and that part of its strategic plan, particularly in the light of its favourable rating in the second round of ballots, will be to look at establishing its own fibre-based infrastructure, both to pick up telephony business, and to play in the TeleMedia marketplace.

In the short term, however, it is quite likely that Australia's first forays into electronic delivery will be built on a fibre/twisted copper pair combination. The overall delivery methodology will be to distribute in high-capacity mode to a data exchange, and then sub-distribute individual requests, that is, fibre optic to the exchange, and twisted pair to the subscriber. Alternatively, the infrastructure might be extended to fibre to the kerb, since a major hurdle to be overcome with fibre to the exchange, is logistical — twisted pair will carry six megabits per second for just over a kilometre, shorter than the average distance between exchange and lounge room.

Outback track

Around 90 per cent of subscribers will be in the city, and, according to Richard Chirgwin, editor of *Communications Engineer*, the situation in the foreseeable future for people in the country will be "the same as it ever was. It's not such an uncommon story however, since even up until 10 years ago people in outback Australia had to pay the civil engineering costs just to get connected to the telephone system. This gave rise to the situation where in outback WA a group of property owners got together to connect on a party line to the local exchange, but didn't tell the telephone exchange that the wire they were running the signal off was the top wire in the fence. Distance and subscriber threshold in country areas will make the issue difficult to overcome, but take-up in the cities should happen quite quickly."

Paying the toll on the new data highway

Cost is possibly the most contentious and confused issue, with competing parties naturally talking up the cost of alternative solutions. If Telecom could reach a cost-per-connect threshold of $1500, it could begin to cost justify the plan. Industry watchers currently estimate that the closest point yet established is at least three times that figure. Interactive services based on coaxial cable will also prove expensive, according to Nowland, with a starting point of up to $3000 per connect, a figure which may well drop to $1500 as the number of homes connected represents an increasingly large proportion of the total number of homes. The potential, he concedes, is enormous. Over three years, a projected 500,000 subscriptions at an average cost of $2000, will return a billion dollars. Optus' role will be strategic, targeting high-potential areas to start generating a revenue stream on which to base further expansion of any network it would put in place, rather than "start laying cable all over the place." It is strategic for Optus to look at the cable option, because it gives direct connection, and allows the company to bypass its competitor in the media, and avoid the interconnect charges. In the meantime, Nowland says, Optus is ready to be a player, since the satellite on which it will base its delivery plan, is already in place.

The fibre and twisted copper pair option is the most cost-justifiable since the twisted copper wire already connects every home

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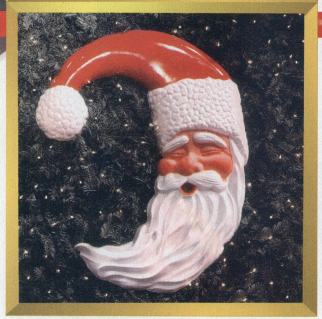
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and business telephone to the network. The cost then, of making each of these connections video capable, by running fibre cable and installing set-top terminator boxes, has been estimated at around $300 per connect. Sources inside Telecom confirm that the figure is close, but decline to talk specifics on cost.

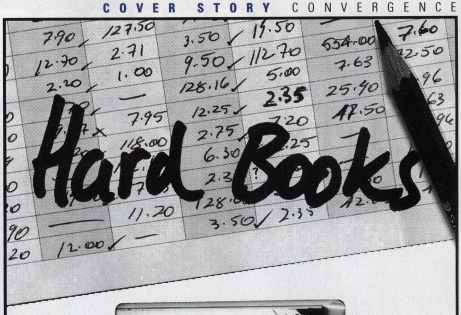
The joy for Telecom in the twisted copper pair solution is that half the capital equipment required is already in the subscriber's house. The other half, a box to terminate the data at the house, is currently available in the US for between $US300 and $US400, comparable with the cost of a satellite receiver dish. When the terminator technology can be put onto silicon the price will naturally fall further. Already AT&T has said that it will have the chipset complete by the end of the year, and other players in the formation of the MPEG-2 standard have projected that the ability to build televisions with MPEG-2 compression will soon follow.

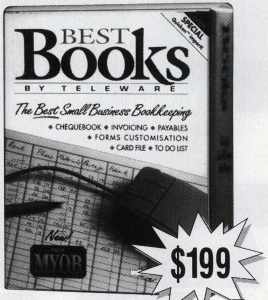
The notion then, is that the receiver technology will be available, either to buy, or to lease as part of the subscriber service, in the same way that Telecom currently provides telephone handsets as part of the rental agreement. Nowland observes that the inclusion of these terminator boxes or chips offers opportunities for service providers to negotiate attractive all-inclusive subscription rates.

Who's driving?

Regardless of structure, the digital data highway represents a potent opportunity for both Australia and for Australian providers of technology. Telecom, having spent millions on infrastructure will no longer represent simply a government instrumentality which provides a phone service, but the key to the delivery of a plethora of digital services. Control of the delivery mechanism is key to power and profitability; thus it is that many large corporations are slavering over the prospect of the privatisation of Telecom. It is a widely held and heavily off-the-record view in the industry that any decision to privatise Telecom would be absolute irresponsibility, putting control over both delivery technology and content in the hands of the same people.

In the US, the media has the power over content, and the telecommunications companies retain control over delivery; telecommunications exponents in this country hold that the Federal government should ensure that Australia follows suit. But to give the last word to Geoff Fagan, "We should be looking for a mix, not a victor. Nothing in this design is simple. The medium can deliver far more than one player should be allowed to dictate. In any case it is a volcano which any one Mr Packer or Mr Murdoch would find it hard to sit on top of."





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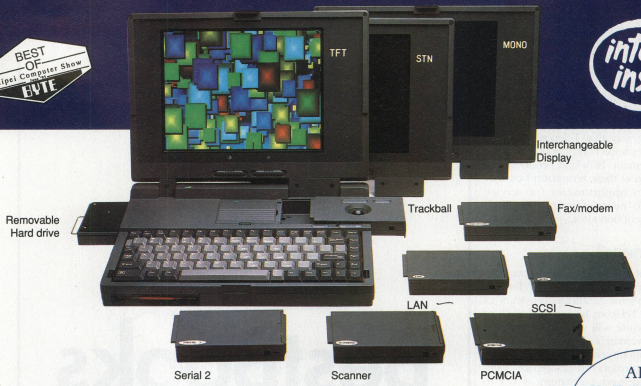
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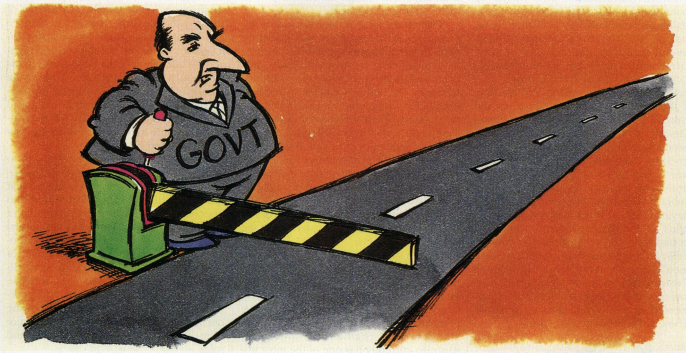
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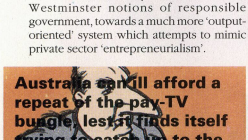
Is our Federal Government ready for convergence?

BY DAN TEBBUTT

Australians have always had a contradictory relationship with the state. Shifts in the public policy paradigm since the 1970s have served to confuse rather than transform this basic status. As recent comments from bodies as diverse as the ALP Caucus Economics Committee and the NSW Chamber of Manufacturers illustrate, the state is still expected to play a crucial role in Australian society and economics. Yet elements of distrust and cynical disregard remain, and have if anything grown in the post-Whitlam era.

The massive state-run infrastructure projects that dominate Australian history have been labelled 'colonial socialism'. Very few major infrastructure projects have been undertaken without a leading role on the part of government. From an extensive list, the Trans-Australian Railway, the Snowy Mountains Scheme and the National Highway System stand out as examples of enormous capital projects which have been undertaken by Australian governments with almost no propulsion from the private sector. Each of the key components of national and regional infrastructure – roads, railways, ports, post, telecommunications, financial systems – were built by government and, until recent years, have been very tightly controlled by the state.

Internationalisation and winds of change in the public sector worldwide have challenged traditional Australian notions and practices. The effects of this are seen in several trends initiated by the Fraser government, which were subsequently effected with great zeal under the Hawke/Keating governments. Privatisation of the enormous public enterprises for which Australia is famous is one such characteristic. Government policies aimed at extending competition into areas of the economy traditionally controlled through state monopolies are a second trend. A third prominent direction is the enthusiastic embrace of internationalisation — the 'level playing field' — which has resulted in an influx of foreign capital and wholesale reorientation of the Australian economy. Public sector goals and structures have also been diverted away from traditional Westminster notions of responsible government, towards a much more 'output-oriented' system which attempts to mimic private sector 'entrepreneurialism'.



Australia has historically placed great reliance on the state to provide the infrastructure necessary for society and the economy to function effectively. There was nothing particularly controversial or politically disputed about this. Both sides of politics favoured government-operated projects and state enterprises as the appropriate way to build and maintain infrastructure. Both parties erected and edified protectionist emplacements over decades, with support from industry and unions.

Current confusion

Fast forward to 1993, though, and these traditional assumptions are under siege. Nowadays, there appears to be little controversy in mainstream politics about the idea of minimising state 'interference', or the view that government should play a less active coordinating role rather than controlling one. Yet the current recession has given rise to a swelling counter-current, with surprisingly diverse support. The agenda of such interests is not sufficiently unified for them to be called a coherent lobby, but their general thrust is that there is an important role for the state to play in the economy and society.

This rather terse framework raises the basic tension that *may* dominate questions regarding building and operating the information highway in Australia. I say *may* because if there is prolonged governmental hesitancy, the highway will be up and running before government's role is defined. Australia can ill afford a repeat of the pay-TV bungle, lest it finds itself trying to catch up to the realities of information infrastructure well into the next century. This tension devolves from the conflicting expectations of traditional Australian reliance on public enterprise to fulfil the nation's infrastructure, versus the well-advanced process of privatisation and internationalisation of the Australian economy.

Debate surrounding the role of government in the building, operation and regulation of the collective infrastructure that will be known as the information highway will be most interesting. After a comprehensive re-evaluation and restructuring of the statutory and regulatory framework, Australia currently has one of the most up-to-date communications regulation systems in the world. Yet despite these reforms — which the Department of Transport and Communications (DOTAC) describes as "arguably the most comprehensive review of communications policies ever undertaken in the OECD," regulatory practice has not always lived up to the formal excellence of the legislation. Without seeking to enter another complex debate, the risible manner in which the pay-TV tendering process has been conducted might lead to the conclusion that such industries are best left to their own devices where possible. Moreover, the complexity of the issues that convergence among media, communications, entertainment and high technology industries presents may amplify concerns that a poor attempt at regulation could jeopardise Australia's future.

Gore's prototype

The US Administration has demonstrated a growing interest in the role it can play in convergence issues. It envisages for itself a pro-active role to guarantee that the information infrastructure is built and operated in a coordinated and competitive fashion. The longstanding interest and enthusiasm — almost obsession — of the vice-president, Mr Albert Gore Jr, regarding the information highway, has been perceived as the catalyst to government prioritisation of the issue. He has been pushing the idea since 1979, when he was a mere junior senator from Tennessee.

In September, a document called *The National Information Infrastructure: Agenda for Action* was released with Gore's blessing. It sets out a number of philosophical positions, complemented by a series of proposals for government action to facilitate the National Information Infrastructure (NII) — the information highway. While many of the proposed actions are mostly of rhetorical value ("removing regulatory obstacles . . . forging partnerships between governments and business"), the commitment of the Administration to these issues has spurred activity and interest.

The US Government is not looking to supplant private enterprise — quite the opposite. In fact, the paper recognised that most of the NII would be privately built and operated, with government expenditure forming only a minuscule part of the total cost. As the document's Executive Summary shows (see side box), a number of basic principles were laid out for the NII: these were designed to ensure functionality, equitable access and coordination. Nothing in the principles of the documents suggested a radical departure from accepted government policies and roles.

It is not so much what *Agenda for Action* says that makes it so remarkable. Rather, it is the document's very existence. That fact alone is a remarkable achievement. It enables the US government to take an active part in shaping the future of an emerging phenomenon which will, in time, have profound impact upon society, communication, entertainment and the economy. Its timeliness is quite spectacular.

The Bell Atlantic/TCI mega-merger has given dramatic notice to the Administration, to Congress, to industry figures and to the American people at large that the information highway is not just a pipe-dream nor the realm of abstruse scientists. By dwarfing many of the strategic alliances that had formed during the previous months, even the big US West/Time Warner deal, this one transaction created an unprecedented urgency among corporate figures in the communications, entertainment, software and hardware industries. Now, anyone serious about being a player on the highway must find partners and build tight structures of vertical integration to have any hope of reaching the demanding virtual markets that the information highway will generate.

Despite some murmuring from Congress and the Justice Department, there appears to be little prospect of governmental intervention to stop this ball rolling. Even if a legislative assault were to be launched against this deal, recent Federal Court decisions and the potential for informal pacts mean that effectively there is little to stop the information highway from being dominated by a powerful oligopoly.

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The National Information Infrastructure: Agenda for action

EXECUTIVE SUMMARY

All Americans have a stake in the construction of an advanced National Information Infrastructure (NII), a seamless web of communications networks, computers, databases, and consumer electronics that will put vast amounts of information at users' fingertips. Development of the NII can help unleash an information revolution that will change forever the way people live, work, and interact with each other:

- People could live almost anywhere they wanted, without foregoing opportunities for useful and fulfilling employment, by 'telecommuting' to their offices through an electronic highway;
- The best schools, teachers, and courses would be available to all students, without regard to geography, distance, resources, or disability;
- Services that improve America's health-care system and respond to other important social needs could be available online, without waiting in line, when and where you needed them.

Private sector firms are already developing and deploying that infrastructure today. Nevertheless, there remain essential roles for government in this process. Carefully crafted government action will complement and enhance the efforts of the private sector and assure the growth of an information infrastructure available to all Americans at reasonable cost. In developing our policy initiatives in this area, the Administration will work in close partnership with business, labour, academia, the public, Congress, and state and local government. Our efforts will be guided by the following principles and objectives:

- **Promote private sector investment**, through appropriate tax and regulatory policies;
- **Extend the 'universal service' concept to ensure that information resources are available to all at affordable prices.** Because information means empowerment — and employment — the government has a duty to ensure that all Americans have access to the resources and job creation potential of the Information Age;
- **Act as a catalyst to promote technological innovation and new applications.** Commit important government research programs and grants to help the private sector develop and demonstrate technologies needed for the NII, and develop the applications and services that will maximise its value to users;
- **Promote seamless, interactive, user-driven operation of the NII.** As the NII evolves into a 'network of networks', government will ensure that users can transfer information across networks easily and efficiently. To increase the likelihood that the NII will be both interactive and, to a large extent, user-driven, government must reform regulations and policies that may inadvertently hamper the development of interactive applications;
- **Ensure information security and network reliability.** The NII must be trustworthy and secure, protecting the privacy of its users. Government action will also ensure that the overall system remains reliable, quickly repairable in the event of a failure and, perhaps most importantly, easy to use;
- **Improve management of the radio frequency spectrum,** an increasingly critical resource;
- **Protect intellectual property rights.** The Administration will investigate how to strengthen domestic copyright laws and international intellectual property treaties to prevent piracy and to protect the integrity of intellectual property;
- **Coordinate with other levels of government and with other nations.** Because information crosses state, regional, and national boundaries, coordination is critical to avoid needless obstacles and prevent unfair policies that handicap US industry;
- **Provide access to government information and improve government procurement.** The Administration will seek to ensure that Federal agencies, in concert with state and local governments, use the NII to expand the information available to the public, ensuring that the immense reservoir of government information is available to the public easily and equitably. Additionally, Federal procurement policies for telecommunications and information services and equipment will be designed to promote important technical developments for the NII and to provide attractive incentives for the private sector to contribute to NII development.

The time for action is now. Every day brings news of change: new technologies, like handheld computerised assistants; new ventures and mergers combining businesses that not long ago seemed discrete and insular; new legal decisions that challenge the separation of computer, cable and telephone companies. These changes promise substantial benefits for the American people, but only if government understands fully their implications and begins working with the private sector and other interested parties to shape the evolution of the communications infrastructure.

The benefits of the NII for the nation are immense. An advanced information infrastructure will enable US firms to compete and win in the global economy, generating good jobs for the American people and economic growth for the nation. As importantly, the NII can transform the lives of the American people — ameliorating the constraints of geography, disability and economic status — giving all Americans a fair opportunity to go as far as their talents and ambitions will take them.

Copies of the 'NII Agenda for Action' in full are available electronically at the following sites:
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Document Name: niiagend.exe (self extracting ZIP file)
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The White House does not seem overly concerned at this prospect, for it understands that the cost of building the information network will require massive financial reserves, which very few players could be expected to outlay. It does not fear collaboration in the 'construction' of the highway. Indeed, the idea of an autonomous alternative information highway system is regarded with the same absurdity as that of an autonomous alternative road highway system. Its attitude seems to be that once the infrastructure is in place, the scope for large-scale competition will widen as smaller companies carve out specialised niche markets. Its basic concern is to foster the maximum level of interconnectivity and broad service. Gore issued a statement the day after the deal was made public, in which he affirmed his support for "any development in the communications marketplace that is pro-competitive and fosters the development of an open, interactive information infrastructure."

The EC response

The European Community has also begun to grapple with convergence. In October, EC Industry Commissioner Martin Bangemann distributed a paper calling for the appointment of a joint public-private task force to map out strategies for creating a computer-based "common information space." It urges the EC, national governments and industry to mobilise to create pan-European telecommunications and computer networks, according to Reuter reports. Drafted as a chapter of the Commission's planned White Paper on economic growth and competitiveness, the report is enthusiastic about the economic and employment-generating prospects of the new technologies.

The paper suggests a typically European approach, with a strong state role considered the foundation for the information infrastructure. Despite their history of nationalistic conflict, the countries of Europe have a strong recent record in multilateral cooperation — better, admittedly, than among Australia's states. The EC should therefore be well positioned to ensure that Europe has a functional and advanced network to meet the challenges of convergence.

Bangemann urges the EC to adopt an immediate timetable and institute an inclusive body to oversee the development of its information infrastructure. "The move to an information society is a highly complex process which requires the establishment of new forms of partnership and cooperation between the different public and private actors," the report states.



Mr Barry Jones: one of Australia's few key players in the political arena with a deep understanding of the potential of technology

Australian reaction

In Australia, we have already witnessed a local version of the mega-alliance genre in the PMT consortium pay-TV bid, which saw dramatic convergence among the biggest forces in the Australian communications, information and entertainment industries. That consortium's failure to obtain a satellite licence is ultimately unimportant. Having collaborated in this venture, the likelihood is that Packer, Murdoch and Telecom (with or without the Ten and Seven networks) will be looking at alternative ways of offering pay-TV, and many other 'convergence' services besides. This consortium will undoubtedly be a pivotal participant in the construction and operation of the information highway in Australia.

Reaction from the various arms of Australian government has been somewhat low key and disjointed thus far, but is gaining momentum. DOTAC and the Department of Industry, Technology and Regional Development (DITARD) have commenced exploration of the concepts involved.

Yet the absence of firm political direction of the issue may see it kept on the backburner for some time. The politician with perhaps the greatest understanding of the importance and potential of technology in society and the economy is the Labor backbencher and former Science Minister, Mr Barry Jones. His 1982 book, *Sleepers, Wake!* (subtitled *Technology and the future of work*), provides illuminating and, in its broad thrust, remarkably accurate reading over a decade later. The tragedy is in Jones' lack of political influence, as Sydney-based technology journalist, Mr Stewart Fist, noted: "Australia has largely sat back in the last twenty years and yawned when Jones speaks. Although Jones is respected worldwide for his ideas and intellect, he has had as much impact on this country's policy direction as has the crystal-gazing mystic in sideshow alley. This is despite the fact that he is president of the ALP."

Talk of Jones leads to the first of three noteworthy developments in Australia. In 1991, the House of Representatives Committee for Long-term Strategies, of which he was chair, produced a report entitled *Australia as an Information Society: Grasping New Paradigms*. As a cynic might expect of this country, the report had as much influence as a syndicalist union official in the Melbourne Club. Nevertheless, the worth of its content might eventually be recognised. Fist suggests that: "Perhaps things will change now Clinton and Gore have set an agenda. Australians only take notice of future directions when someone else points the way, particularly if that someone else is the United States, Japan or Europe. It's our colonial mentality."

The second development is a recent call for tenders from Telecom. In October, the government-owned telecommunications carrier called for primary and secondary contractors and partners to build an information highway system which would be the basis for future pay-TV and other broadband services. It is expected that consortia of local and multinational corporations, from various fields of expertise, will seek the various contracts to supply, construct and service the infrastructure project. One of the expected leading bidders is US cable giant Continental Cablevision, an unsuccessful pay TV bidder. Its CEO emphasised that this project provided alternative routes into the Australian market.

"No-one who understands the industry would lock themselves into just one transmission technology. Ninety-five per cent of our business in the US involves cable, but that may not be appropriate in Australia in the short-term," Mr Martin Hannes recently told the *Australian Financial Review*.

"The idea will be to look at using different technologies for different tasks — whether you're serving the metropolitan areas of Sydney and Melbourne or the country — and whether cable or satellite is the best solution."

The project, going under the name Telecommunications Intelligent Network Architecture (TINA), will be based on a combination of contracts for specialised services and broad partnerships. Already, British Telecom, Japan's NTT, America's AT&T and IBM have expressed interest in participating in this venture.

Speaking to the recent annual meeting of the Australian Information Industry Association, Telecom's head of the project, Mr

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Doug Campbell, predicted a bright future for convergence technologies. "We expect the concepts that underpin TINA to mature in around four or five years," he said.

He left no doubt as to the economic benefit that Australia is capable of attaining from intelligent use of the information highway. "Australia is well placed, not to go it alone and attempt to create and develop a global industry of this magnitude by ourselves, but to play a significant part in a potentially immense enterprise, and to keep open a vital window for local software developers and niche-service providers," Campbell argued.

Realistic aims were vital to finding a place in the web of international and corporate interdependence-forming convergence markets. Mr Campbell said, "The solution is to create a market for the world and to ensure that Australian suppliers have a place and a future in sharing that market."

The Communications Futures Project

The third development is the instigation of a Communications Futures Project (CFP) by the Bureau of Transport and Communications Economics (BTCE), a division of DOTAC. This major research project will seek to chart the future of government management of communications, disseminating a series of working papers for comment. Papers and feedback will be integrated into a major report due in 12 to 18 months' time. It will work with the concurrent Broadband Services Expert Group, which is examining the extension of the fibre-optic network and its potential consumer uses. The CFP's Terms of Reference (see side box) suggest that it should be an important and forward-looking study, the significance of which will grow as convergence issues begin to flesh out.

Launching the project at a recent BTCE Communications Research Forum, CFP research manager, Mr Chris Cheah, said, "This project is essentially about looking ahead to the technological changes happening in communications, the potential market responses, and the regulatory implications of these. The project should keep us ahead of the game, ensuring that there is an informed policy debate, and consequently that the regulatory framework enhances rather than frustrates opportunities for Australia over the rest of the decade."

Cheah's speech and the project's research design show an impressive grasp of the issues at hand, and the potential stakes for Australia if we get in on the ground floor. He recognises that the recent overhaul of the telecommunications regulatory environment may be superseded within the next few years by the far-reaching effects of convergence. There is already provision for review of these regulatory components from 1995 as a matter of course, and Cheah sees the CFP and Broadband Services research as a fundamental part of that review process. The CFP itself will examine four streams of issues:

- Services, content and marketing;
- Delivery technologies;
- Market behaviour; and
- Policy and regulation.

The final report will seek to tie together the work of the specialised project 'modules' and incorporate public responses, placing the study within the context of wider economic and global communications developments. A Steering Committee comprising Mr Mike Hutchinson, Dr Maurice Haddad and Mr Fred Brenchley will oversee the undertaking.

In many ways, it is surprising that there is less overt political enthusiasm for the project. It certainly accords with the Keating vision of an outward-looking, high-tech Australia. Communications minister, Mr David Beddall, and industry minister, Mr Alan Griffiths, have lent their support to the issue, but in a rather taciturn fashion. Strong and capable political impetus is needed, though admittedly this is not an easy task given the complexity and multiplicity of the issues involved. Nevertheless, if our political leaders are seriously daunted by the complicated nature of convergence, the nation's future could well be compromised.

Private benefit, public good

There remains in all of this the potential that private enterprise may resent state interference. Certainly in the US, some players are not keen for government involvement, however low key. The former chairman of Apple, Mr John Sculley — who has begun a small company aiming to provide strategic services to information highway participants — recently told a Washington gathering on the NII called the 'Networked Economy Conference': "It is impossible for regulators to move as quickly and as effectively as the dynamics of free market competition."

He called the proposed $26 billion Bell Atlantic/TCI merger "the most definitive evidence yet that the digital communications revolution can and should be implemented by the private sector, not built and paid for by the US government."

Despite such effrontery, US secretary of commerce, Mr Ron Brown, maintained that the highway would depend on an active partnership between the public and private sectors. He claimed that the White House regarded the information highway as a "first-rank priority."

"The public and private sector must come together under a single, common goal," Brown told the conference. He argued that regulation was not designed to impede the private sector, which would build and operate the bulk of the information highway. He did, however, maintain that government action was necessary to ensure that there was the highest level of interconnectivity and standardisation between the various networks which would compose the NII, and that universal access and a competitive environment were assured. The equivalent struggle in Australia will prove most interesting because of the tension already outlined.

Regulating the information highway will require an abandonment of many traditional mechanisms and assumptions which have dominated communications regulation. Rupert Murdoch, whose multifarious interests in convergence businesses and the information highway needs no introduction, told a London audience earlier this year: "Convergence is seeing some of the world's largest industries trying to accept a new age in which few of the old rules seem to apply and traditional distinctions are breaking down. Five of the world's biggest industries — computing, communications, consumer electronics, publishing and entertainment — are converging into one dynamic whole."

More bluntly, *Washington Post* journalist, Ms Cindy Skrzycki, put it thus: "There are no laws in cyberspace and, if there were, it might not matter."

The medium or the media?

The most exciting facet of convergence is that the medium ought to grow less important than the information conveyed — at least in terms of its technological capacity, as opposed to the revenue-generating role of the distribution medium. It can even be

Communications Futures Project: Terms of reference

The CFP Team will examine and report on:

1. Likely developments over the next decade and beyond in information, entertainment and communications services and technologies;

2. Implications of these developments for market participants in those industries, including:

(a) the underlying economic factors influencing industry growth and change;

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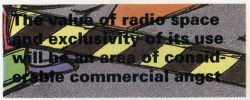
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argued that the revenue importance of the medium is not so much in its inherent value but in constituting part of a distribution chain.



Mr Michael Schulhof, CEO of Sony USA, recently argued, "A new technology is rarely a replacement. It's a layering process." For this reason, a heterogeneous mix of media will compose the information highway: fibre-optic cable, coaxial cable, satellite transmission, MDS, digital and analogue cellular devices, even copper phone wire. The means used to convey the message will not be critical, as long as they can be seamlessly integrated and permit a reasonable level of data transfer. This concept is elementary to the whole idea of the information highway. The implication from this for regulators is that media should not, and in the long run can not, be governed according to the mechanism they use to transmit. A new approach is required which accommodates the totality of the agglomerating information, communication and entertainment industries — in industry jargon, "technologically neutral regulation."

Similarly, the integral interdependence of the world economy will have profound repercussions for the ability of governments to regulate domestic markets in isolation. Internationalisation is no flash in the pan, and the convergence and networking of multimedia communications is one element of the shrinking 'global village'. Satellite and other new technologies make it impossible to restrict communications and information to existing political, social and economic barriers. While broadcasting and communications structures have been fundamentally international in character for several years, regulatory bodies in contrast remain domestically oriented. Internationalisation seriously challenges the ability of domestic authorities to control the information and channels of communication available to the people of that nation or region. In addition, endemic convergence among products, services and advertising available around the world interacts with the standardisation of communications technology and content.

Analysts point out the widespread inability of governments to fulfil their aims in communications policy — aims such as control of concentration of ownership and local content levels — within the relatively static traditional forms of communications and media. British academics Negrine and Papathanassopoulos draw the conclusion that individual states are arguably incapable of effectively regulating telecommunications domestically. The decentralisation of information dissemination that may result from free-flowing interactive communication on the information highway forebodes an ever greater loss of state control over communications, entertainment and information in society. Even the Chinese government's recent heavy-handed banning of satellite dishes will not be totally enforceable, according to observers; it only takes one secreted dish and a bit of cabling.

Nevertheless, Negrine and Papathanassopoulos caution that "one must not underestimate the power of national governments. Their ability to, if not quite prevent, then at least participate in the shaping of satellite television and other media through the exercise of certain established structures, long-standing practices and traditional expectations must not be overlooked. What may be in decline though is the absolute control which governments used to exercise over broadcasting affairs."

Management of the radiofrequency spectrum will become an increasingly heated task. An ever-growing number of vendors will seek to push more and more data through this large but ultimately finite resource. Thus, the value of radio space and exclusivity of its use will be an area of considerable commercial angst — inevitably requiring governmental supervision. In Europe, and to lesser extents North America and parts of Asia, the physical proximity of nations will ultimately dictate that spectrum management be under multinational control. To this degree, Australia is somewhat fortunate in its geographic isolation.

Privacy and consumer issues

Obsessive civil libertarians that they are, Americans have engaged in highly moralistic debates over the many privacy issues that technological convergence raises. The Electronic Frontier Foundation (EFF), a lobby group for users of the Internet and other major networks, has worked Washington hard, seeking complete liberalisation and deregulation of private communication across the information highway. It is concerned to prevent monitoring and interception of users' private communication in any circumstances. EFF has condemned the strict regulation of encryption technologies, which has demanded that law enforcement agencies be given access to decrypting tools for formally authorised surveillance or interception. Government officials have argued that it is important that, within the bounds of the appropriate process (that is, the necessity to obtain a court warrant), the state be able to monitor 'criminal' or 'seditious' activities on the information highway, in the same way that telephone and other forms of communication are monitored. Again, a technologically neutral approach by government would appear to be the only way to deal consistently with the various modes of communication that the information highway will facilitate.

Another concern is the potential to invade individuals or corporations' privacy. This could occur in a number of ways. Firstly, the threat of anonymous electronic harassment provides frightful potential to undermine people's rights in a most malicious manner.

Service users' habits may also be monitored and exploited for commercial gain or graft (for example, blackmail). The ability to manipulate large, interconnected databases of information concerning people, their personal details and their habits implies that the free-flow information that convergence is stimulating includes the possibility of a multiplicity of corporate and governmental 'Big Brothers'. The damaging effect of genuine mistakes in information compilation and dissemination is well documented in the credit reference industry.

Governments will also be concerned, to varying degrees, to ensure some element of social justice in the spread of the information highway and its services. The concept of physically making the service universally available (whether the consumer elects to receive it or not) is a basic underpinning of the Gore philosophy, and could be expected from a Labor regime in this country. The corollary of this is the economic accessibility of interactive services, and this is likely to see more diverse philosophical reactions from different governments.

The interesting conclusion from these issues though, is that the information highway does not foreseeably create wholly new dilemmas for regulators. It does, however, give rise to much more complicated variants of current problems. With a return to basic principles in areas such as privacy, law enforcement, consumer rights and trade practices law, it is possible that the existing moral underpinnings of current legislation can be applied to these variants. The application of such generic principles may bring within reach the ultimate goal of fair and liberal dealing in information.

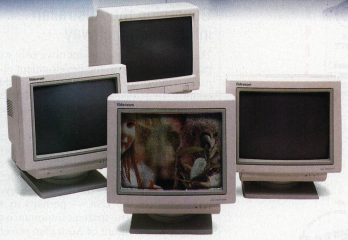
Service provider issues

Doubtless many service providers will at times demand government intervention as vigorously as they plead for less interference at other times. The setting of standards will of course involve government coordination, though it must be done with

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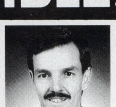
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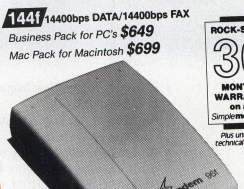
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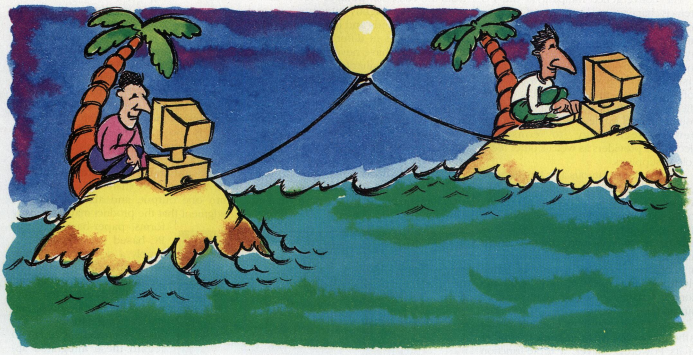
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the active support of industry or it risks being irrelevant.

Accessibility of the information infrastructure to aspiring service providers may pre-occupy governmental attention. The overwhelming trend towards corporate bloc-forming which has coincided with technological convergence has sent shivers up the collective spine of consumer groups, some public officials and furthermore marginalised corporates. They fear that the information highway of tomorrow may be ruled by giant oligopolies who restrict competition and strangle rivals. The lead from the White House argues that such alliances are necessary to construct the basic infrastructure and that smaller players with quality products will be able to reach niche markets. Notwithstanding such optimism, Gore has admitted that the Administration may have to intervene to assure competitive practices predominate. Convergence and the amorphous potential of the information infrastructure present numerous challenges for government. Yet this analysis suggest that, with re-evaluation, existing principles and regulatory fundamentals can generally be adapted to cope with these demands. It will not be an easy task. Government will be challenged and stretched by these new technologies, but probably not be rendered obsolete. For information highways can be no more self-regulating than road highways.

Governing the Australian information highway

The Australian Government obviously will play a crucial role in the development of a robust information infrastructure in this country. Certainly, no-one expects that the information highway will be another Snowy Mountains Scheme: times have changed, and government will not try to go it alone in the information highway. Through Telecom the Federal Government will have a degree of control in implementation and operation of the highway, a lever unmatched in the USA — perhaps to Al Gore's chagrin. The strategic importance of that role to the future of Australian society and its economy should militate against any desire to sell off Telecom. This public corporation is no longer the sleeping giant of yesterday. Its ability to modernise and forge incisive partnerships suggest that it will be one of the most important tools for the Australian Government as it seeks to develop a sophisticated, accessible and profitable information infrastructure. This infrastructure, the information highway, will be at the heart of Australia's international competitiveness into the next millennium. It is too big an issue for our governments not to take a pro-active and passionate interest.



Here and now

Products fusing the medium with the message.

BY HELEN DANCER

We have explored the convergence of technology types, strange partnerships forged between players in diverse industries, and the marriage of vested interests to complementary technology skill-sets. The fusion of information with entertainment, of telecommunications with computing, and the marriage of all three to deliver the same old story in a radically different way is accompanied by a convergence of a much more insular, but equally paradigm-shattering kind.

Even the world inside the PC is exhibiting every evidence of convergence. The PC, which was seen as a revolution in personalising computing, a machine which gave individual control over the power of processing and storing information, is evolving into simply part of a wider framework. More than 60 per cent of business PCs are attached to LANs, the projection for the coming years is that a far greater proportion of the total will be connected, at least occasionally to others, to dispense, collect or simply share information.

The myth of continuous connection has been well and truly exploded with the rise in popularity of the notebook computer and fax modem, and the acceptance that work which contributes to a particular project may be carried out from remote locations and disparate time zones, not simply by a finite group of people in one nine-to-five office. Nevertheless, ubiquitous access to information is still a paramount requirement of these geographically remote users. It appears then that the poet Donne was correct in his assertion that no man is an island, and that even for those PCs which function for the most part in isolation, it speeds productivity if there is an efficient ferry service.

The convergence rampant in the PC arena is characterised by the rise of application suites, a new breed 'super app', the emergence of the network as the strategic layer, replacing the operating system as the critical place to play, and the blurring of the distinctions between hardware and software, with the emergence of the Microsoft At Work strategy and the announcement of Apple's intention to license Newton technology to consumer electronics providers as well as other technology suppliers.

It would be as fatuous as a Mr Okimura television commercial to suggest that you will be able, in the near future, to send a fax to the waffle iron and the coffee pot to tell them you'll be home in 10 minutes, so they had better start weaving their culinary magic. But nevertheless, the convergence of what we currently accept as home electronics and typical PC forms and functions, is certainly set to change the way we buy and use both.

A right-here, right-now example of this is the announcement from Apple Computer of its PowerCD player, a triple-function computing, image storing and audio device that will connect equally well to a television, to replay Kodak PhotoCD formats, or to a Macintosh computer, to play audio compact discs, or run CD-ROM-based software. The fusion of the two, up until now disparate processors with similar processes, is a signal of the maturation of the technology, and the recognition that a PC and its appendages is not a foreign body, but part of the greater information and entertainment whole.

Another is Intel's Smart Video Recorder technology, which uses a home video recorder as the video-capture mechanism for computer-based video. Segments can be recorded, edited on the PC, compressed and sent to another PC, which can then play back the video message. The record part of the technology is hardware based, but the playback is software based; it is not necessary to have the video hardware installed to replay a message. It is technology on demand, according to Intel's Geoff Healey, who asserts that the world is ready for desktop video. The difference in the quality of communication between showing someone a map, or simply describing a street pattern and a navigation path, translates into immense opportunities for a low-requirement video solution.

Suiting the deal

Applications suites are bundles of application types, still as separate entities, but packaged and sold together for a lower price than the cost of acquiring each of the applications individually. The rationale from the customer point of view is this: if the package is tightly integrated, so that similar commands and icons perform the same functions in different applications, then even if I have never used a spreadsheet before, familiarity with the running of another application from the same vendor puts me at least a step ahead of choosing a spreadsheet from a different vendor where all the 'road signs' might be different. I need to produce some monthly figures for this afternoon's meeting, but I don't have a lot of time to spend messing around, and I don't really want to ask for help, because it's a tacit acknowledgment that somebody else knows more than me. Hmm.



Lotus SmartSuite: A group-centric bundle of software that allows users to share information between different applications

The rationale from the vendor's point of view is the bottom line — market share and revenue. Sales of bundles leverage other products in the suite into marketplaces they might not otherwise have had the opportunity to go. Forcing competitive products out is a strategic aspect to suite marketing. What company in its right mind would spend money upgrading its existing word processor, even if it has been the accepted product of choice for users, if the bundle on which it had just *spent* a bundle, basically for the graphics and the electronic mail, also had a brand new fully-featured word-processing package? Lotus achieved this coup over WordPerfect in QANTAS, ousting the popular word-processing standard with its many-in-one offering — and no doubt similar examples from other vendors are manifold.

Application suites speed work processes, the vendors say, because they allow faster, more efficient access to one application from another. Users can switch in and out of a word-processing document, pulling sets of figures out of a spreadsheet, into a graphics application, turning them into a fancy visual representation of the results, and pasting these straight into the word-processing-based report.

These applications share common base code, to allow such information types to be so seamlessly transferred, and to allow common processes to be represented in the same way. Familiarity is the key to productivity. A user can complete a task far more efficiently if the tools are familiar.

It is also an overdue acknowledgment that tasks are not discrete, application-constrained projects, but combinations of words and numbers, pictures and graphs, the work of more than one person rolled into one output, and also an acknowledgment that the product may take many forms; paper-based reports, PC-based presentations, or simply a document which is electronically delivered around the organisation and beyond. Because of the structure of the applications, and the evolving structure of the projects created, it is fair to regard these integrated applications as a new genre, rather than to continue to regard them as a set of parts which make up the whole.

Core competence

Whose bundle you choose then depends on a more subtle difference. The different providers have taken trouble to reflect their core competence in the way they have structured their suites. WordPerfect, for example has structured its WordPerfect Office around its core competence — document management. Its docucentric bundle offers much the same functions as its competitors, but with a strong emphasis on the improved ability to create, manage and send documents.

Lotus' SmartSuite focuses on the company's working together strategy — that not only must let each of the applications work more closely together, but the people who use them will need to share information, and that work may need to be brought across from other application types and brands. SmartSuite might accurately be called group-centric, and future development of the suite no doubt will reflect the group enabling functionality of Lotus Notes.

The new version Microsoft Office, Version 4.0, features IntelliSense technology, focusing on intelligent management of the user as much as the project. IntelliSense utilities will automatically correct commonly made typing mistakes and misspellings — one wonders what it would make of the

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Beyond groupware

BY HELEN DANCER

Thom Fraser is vice-president for international operations for Beyond, a company which develops and markets electronic mail products, notably BeyondMail.

Fraser and co-founder Chuck Digate escaped from Lotus Development prior to the development of Lotus Notes to establish Beyond, and based the company's offerings on an email-centric rationale of a philosophy similar to that behind Lotus Notes — of improving productivity by providing intelligent interfaces which can offer active assistance, rather than simply connecting people together. The Beyond product, WinRules, has latterly been adopted by Microsoft in Australia to complement Microsoft Mail, making the user interface more intelligent.

Fraser visited Australia earlier this year to present the keynote address at a groupware seminar organised by AIC. Lateral thinking, incremental improvements and death to vapourware and Nazi-ware were high on his agenda when he spoke to Helen Dancer during the visit.

Fraser: What we need is an approach which is more attuned to lateral thinking; we need to get over the inherent gestalt which has become linked with the concept of groupware. You see a box, right? And you're never going to solve the problems in the box until you get out of it, or deconstruct it altogether.

APC: We've been told all along that groupware is a revolution. You mean to say what we should be striving for is a non-revolution?

Fraser: Absolutely right. Many of the theories and products of groupware predate the PC revolution, so what we are talking about is essentially not a new thought. Also, it's quite consistent with the concept of JIT or TQM for which the Japanese are so renowned — the concept of improving things incrementally, adding gradually to either the knowledge store or the overall capability, the old adage that 'if it's not broken, don't fix it'. The new version of the adage seems to have become 'let's tear it apart and do it again' and that's crazy, in terms of both organisational strategy and the dislocation it causes to the people involved.

APC: But Business Process Reengineering has rapidly become the buzzword of the decade. What's wrong with replacing processes that don't work rather than just making them go faster with computers?

Fraser: That's fine — restructuring businesss processes that don't work is a sensible business decision. What I'm talking about is the common misunderstanding in the community that to install groupware you have to toss everything out and start again. In that context, groupware becomes Nazi-ware, in that there's a strict imposition of a rigid structure on a company from the top down, which says 'you will do it this way, you will toss out what you know and become group enabled, overnight'. And that's counter-productive and alienating at the same time.



Mr Thom Fraser on BeyondMail: Email isn't rocket science — people can grasp it really quickly

APC: So groupware as it stands is a fascist regime?

Fraser: That's the way it's being construed, because the company that has the biggest profile as a groupware provider at the moment is advocating this bloody overthrow. There's a good reason for that, too. Why does Lotus love Business Process Reengineering? Because it has a radically new product which might not fit in with what your business might have. A lot of companies are being frightened off for that reason. What we are advocating is an evolution rather than a revolution.

And in this, several issues are involved. Firstly, a recognition of a few things. This is not a pain-free or cost-free process. You have to get side by side with the customer, and work closely together. Because to take on groupware, he's going to have to spend more money than he thought he was going to, and certainly more time than he thinks he can afford. He certainly can't just go through an evaluation, in the way you can with another kind of product. But to put in place the technology without spending enough time will inevitably be a waste of both the money and the time that has been expended.

APC: Then aren't you contradicting yourself, in that if Lotus advocates a total rethink, it's being fascist, but you just understand that it's going to take a lot more reorganisation than the company expected? Isn't it like saying 'I am temporarily unemployed, you are a dole bludger'? What's the difference other than emotive terminology?

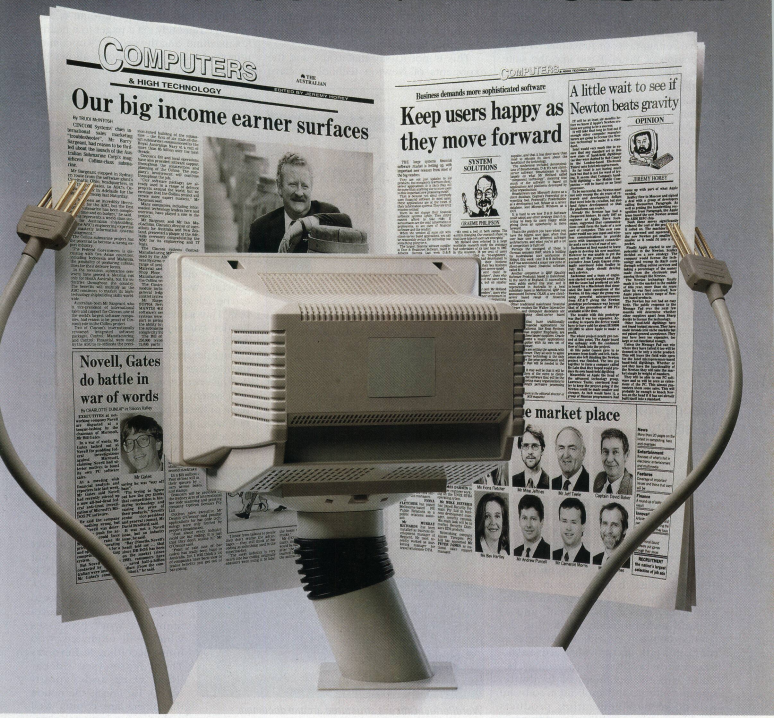
Fraser: Not at all, because there's no need to assume that it all has to go out the window from day one. The position that Beyond adopts is one of starting with what you know. And what's the most common infrastructure in business today? Electronic mail. The most logical evolution is to group-enable people from within their electronic mail, get them comfortable and take it from there. Give them rules, write Boolean logic into the software so that it becomes intuitive rather than just simple messaging, and so on. There are plenty of group-enabling technologies that can speed productivity, it's just too confronting to expect people to take to them all at once. The joy of it is that email isn't rocket science — people can grasp it really quickly. And intelligent email begins an organisation's transition to groupware.

APC: Is this lack of general understanding the greatest inhibitor to the spread of groupware technologies?

Fraser: No, and that's the part that makes me so angry. It's not the misunderstanding, but the misinformation. Vapour ware and half truths hurt the industry more than anything, and that's what is going on. We just had Microsoft [at the Groupware seminar] saying: 'Wouldn't it be wonderful if the world had products that could do this and this and something else?'. But the subtext was: 'Wouldn't it be wonderful if Microsoft had products with these capabilities?' What's going on is that Microsoft is trying to lull the groupware-aware public into not buying anything until it has its product set out on the table. Which makes me really angry because it is misinformation, because these capabilities do exist. Beyond customers are just going about doing most of those wish-list things already, but nobody gets to hear about them because the Microsoft voice tells the world it can't be done yet because Microsoft hasn't invented it.

Vapour is what hurts the industry the most. There's a famous hockey player who tells his secret of success thus: 'I don't try to be where the hockey puck is now, I just aim to be where it's going to go next.' In the context of the computer industry, we're not going to get anywhere unless the players tell each other honestly where they are now, otherwise we might individually project that the puck is going to be in a certain place, and be way off, because we were given misleading information. If it's bad for the industry, it's bad for the customer as well.'"

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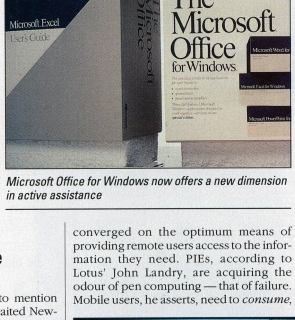
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word IntelliSense? The new-look Microsoft Office is intuitive and offers a new dimension in active assistance, in its ability to sense how a user works and to then offer context-based tips on how to more speedily achieve certain tasks or functions. The incorporation of Visual Basic into the suite also enables a workgroup or workplace to take the functionality of each of the applications and further customise them to suit a particular work process.

Each of these suite strategies are a tacit acceptance on the part of the vendors that the cost of ownership of an application goes much further than the initial price of the software. It extends into learning time, document creation and management, and the annals of corporate history. In this sense applications, like filing cabinets, converge with their contents; thus the medium becomes fused with the message. Flexibility to use and reuse information from within each of these suites is therefore the ultimate goal.



Microsoft Office for Windows now offers a new dimension in active assistance

Making work a remote possibility

However many teething, not to mention spelling problems, the long awaited Newton-based PIEs may be experiencing, they represent a watershed in remote computing and communicating. The ability to stay connected, itinerantly rather than continually, and to pass information with other members of a workgroup is an accurate reading of the demands of the marketplace.

The evolution of Newton technology is essentially as much an exercise in cultural anthropology as base-code programming. The ability to anticipate intent, and to respond technologically marks the difference between providing the tools to complete a task, and providing active assistance for that task. Newton technology, because it is the synthesis of hardware, systems software and application software will make new-generation products capable of making that leap to active assistance, and is thus a significant paving stone in the broader data highway.

The concept of what constitutes a workgroup and who its members are has been largely redefined by the introduction of groupware products such as Lotus Notes. Workgroup members are not confined to one group — since each may contribute at different levels to many various projects simultaneously, to one geographical location or one time boundary.

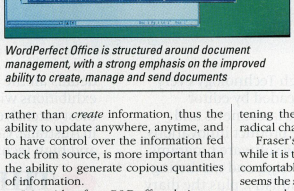
The convergence of computing and communications technologies is an important contribution to improving the workflow between remote users and the centre, or simply between remote workgroup members.

This is not to say that Lotus and the exponents of Newton technology have converged on the optimum means of providing remote users access to the information they need. PIEs, according to Lotus' John Landry, are acquiring the odour of pen computing — that of failure. Mobile users, he asserts, need to *consume*, rather than *create* information, thus the ability to update anywhere, anytime, and to have control over the information fed back from source, is more important than the ability to generate copious quantities of information.

It is evident from R&D efforts being put into cc:Mail at Lotus that this ability to control information flow from remote locations is a key strategy for the groupware leader. Future versions of cc:Mail will offer the ability to re-route a mail message remotely via a pager to a nearby fax machine, and the product's upcoming remote version for Windows allows the receiver to preview the contents and size of messages waiting, and choose to download only those which are relevant or appropriate to the time.

Microsoft in Australia has chosen strategic partners to provide greater functionality to its growing Microsoft Mail community. Electronic mail, it maintains, is in itself sufficient as a platform for ubiquitous access to information. Intelligent management of electronic mail messages received is provided by Beyond's WinRules, which offers rules processing and workflow-management capabilities. Users build profiles and rules to manage workflow either while they are away, or to structure workloads so that certain tasks can be delegated to other workgroup members. Thus a rule might read: IF the message header contains the word 'conference', AND the message contains information about sales, prices or dates, THEN forward the message to Janet.

This exercise in Boolean logic allows the mail system to exercise intelligent management of the information, so that work does not back up, and important opportunities are seized rather than lost. The important distinction between WinRules and its rules-based competitors is that the rules and user profiles are server based: Thus if the user goes away on holidays and turns their PC off, the rules will still function. There are competitive products which offer the same functionality, but only while the recipient's PC is active.



WordPerfect Office is structured around document management, with a strong emphasis on the improved ability to create, manage and send documents

It is technology's ability to make incremental improvements to work processes which will ultimately woo users, according to Beyond's Thom Fraser (see sidebar 'Nazi ware and vapourware'). He rejects the notion that users are coping well with the fundamental changes to the familiar computing paradigm, and asserts that technologists should be softening the blow rather than promoting radical change.

Fraser's point is well observed, but while it is true that customers will pay for a comfortable ride on the data highway, it seems the situation calls for measures more comprehensive than simply stacking cushions in the rickshaw.

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Converging technologies: A maturing market or cataclysmic collision?

Robert Schechter and Michael Spindler— two minds from disparate but intrinsically related technological fields, software and hardware, outline their views.

BY HELEN DANCER

The point at which two technologies converge, or even collide, is often the point at which they will achieve the widespread popularity or market share which marketers project and to which developers aspire. In many cases this convergence, or collision of technological forces, also gives rise to a third, either by radical fusion, or because together they create the perfect enabling environment for a totally new product.

The success of some technologies, or their rapid widespread adoption is more than simply a fortuitous accident. Lotus Notes, for example, arrived with perfect timing, into a computing environment characterised by lower priced, higher powered machines, and an increasing population of PC LANs in business installations. According to Robert Schechter, Lotus Development Corporation's senior vice-president, International Business Group, it was no accident.

"It is true to say that there is an inevitable connection; advances in software are reliant to a vast extent on the underlying technology; chip speeds, availability of reasonably priced memory, and so on. In the networking field, it is dependent on a vast local area network, and more than that, the growing wide area and cellular connections."

Lotus originally envisaged designing its flagship spreadsheet product Lotus 1-2-3 for the Mac platform, but during initial development, IBM announced plans to build a 16-bit PC, rather than the eight bits on which the Mac was built, and the product finished up as the acclaimed Lotus 1-2-3 for DOS. It was, Schechter concedes, the single most important decision ever made in the company, a claim attested to by the enormous success of the product on that platform.

In software, it is a matter of reading the market aright, and building for the future rather than the present. Not serendipity perhaps, but certainly the ability to watch the development curve. There's a set of enabling technologies for every new technology, each of which is travelling along a market penetration curve, he says.

The talent is to understand which technologies are essential for the success of a new product, and the point at which these technologies will intersect, converge or achieve critical mass in the marketplace. An understanding of your place in the curve is essential to knowing the point at which you can make a successful entry into the marketplace. Notes then, was poised to arrive at the point of intersection of PC LANs and lower priced servers, both critical for its success. "Notes was shipped at Version 2.0," said Schechter. "Part of the reason for this was the market readiness of the product at that point rather than at any time before that. And indeed much of the success we have enjoyed with Notes has been with Version 2.0. But apart from the desire to have Notes ready for the market, it was a matter of watching for a market which was ready for Notes." It's an exercise in future technologies, Schechter says.

The reason that client/server software is enjoying such success today, he asserts, is the wide availability of powerful affordable server machines and the concurrent availability of 32-bit operating systems.



Lotus' Robert Schechter: "In software, it is a matter of reading the market aright, and building for the future rather than the present."

Notes requires a LAN environment, and powerful PCs to act as file and communications servers, neither of which were commonplace when Notes development began. "You're building product that will take advantage of technologies which will come to market a year, maybe longer, down the track," said Schechter. But it's not blind faith, either. "We weren't surprised, for example, that OS/2 came to market. We chose that point in the curve to present Notes capability to an enabled audience. It does take time. If you look at the really hot companies in client/server architecture, companies like Powersoft, Sybase, they have been in the marketplace for a very long time. They are hot now, but it has taken time."

Apart from the development community, he says, there's a great deal of future-gazing to be done in deciding what users will need, and as a separate issue, what they will choose. The new option in Notes Version 3.0 [released in March] to run a Windows-based server will bring Notes capability to a new less powerful technology environment, and, according to Schechter, allow users who wanted Notes functionality when they chose Windows for Workgroups, to access that capability.

Absolute interoperability, he says, will be mandated in all Lotus developments, a feature which he maintains offers a significant differentiator by which the marketplace will be guided.

Notes provides a level of services above an operating system — a very robust object database that handles text and rich text, images, voice and video, as well as numerical information. It also includes a messaging service and replication technologies, allowing many people, including occasionally connected users, access to the same quality of information. In essence, it has engendered a new usage for technology, and just as it took advantage of its own technology enablers, has engendered a new enabling environment.

Continued on page 106

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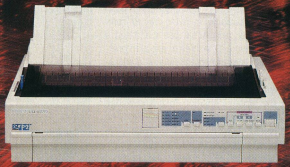
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In a giant game of technology leapfrog, new generations, built on existing paradigms but employing future technologies, will engender radical change and fusion rather than intersection, according to Michael Spindler, CEO and president of Apple Computer. Speaking at the National Press Club Luncheon, on a visit to Australia earlier this year, Spindler prophesied that we are on the threshold of significant change, based on the convergence of technologies, notably telecommunications and computers, and that this convergence will radically expand our usage of computers as an experiential resource, as well as forcing a redefinition of the conventional boundaries of a computer's capability.

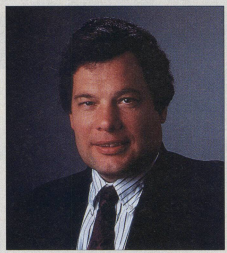
His appearance at the National Press Club, a generalist rather than specialist information forum, is in itself significant. It exemplifies Apple's measure of success in crossing the demarcation zone, bringing computers beyond the world of the office and the classroom. The 'computers for business processes' paradigm is giving way to 'computers for people', and Apple has mandated a future which delivers a machine of social interaction capabilities, entertainment value and educative purpose.

Borrowing from Taichi Sakaiya's observations on the global transition to a Knowledge Value Age, Spindler observes that in moving from the Industrial economy to the Information-based Age, "We cannot predict the future; therefore we must invent it." Technologies, he says, will only have an impact on the social fabric if they are perceived to be useful, compelling, almost addictive, and affordable. People are excited by the notion of something which relates to the paradigm with which they are familiar, but changes it, rather than something which is totally foreign.

The concept of television, he asserts, began with black-and-white transmission and two channel alternatives. The changing paradigm brought full colour and sixty channels of choice. The future, he says, rests not with incremental improvements such as HDTV (high-density television) but with quantum changes such as the ability to interact with the television and have it deliver a wider variety of services in a much more dynamic and user-driven fashion.

Likewise, traditional technology will require closer integration to become truly useful and receive wider acceptance. Technology has delivered highly sophisticated medical diagnostic tools, but does not yet allow those services to be delivered as efficiently as they could be. "When you're really sick and you go to the hospital, you just want treatment as fast as possible. You don't want to be asked what you name is, your address, phone number, what your social security number is and whether or not you have medical insurance. Storage on CD-ROM and better delivery of all that information, which is basically already there in some giant computer, will help deliver the service of better medical attention in a way which will give technology a higher approval rating among users," said Spindler.

The convergence of telecommunications and computers will take both industries beyond the limitations of current definition and usage, removing at the same time the need to deliver information in different media in disparate rather than combined form. The telephone will represent more than solely a means of transporting voice, and the computer more than a box for the storage and retrieval of information. And there has been a tendency, Spindler says, to regard the people who access information from these computers in much the same way as the terminals which provide the front end to the information repository. "To treat people as terminals, however, whether dumb terminals or intelligent ones, is not good practice."



Apple's Michael Spindler: "What we're talking about are options, rather than imposing electronic delivery . . ."

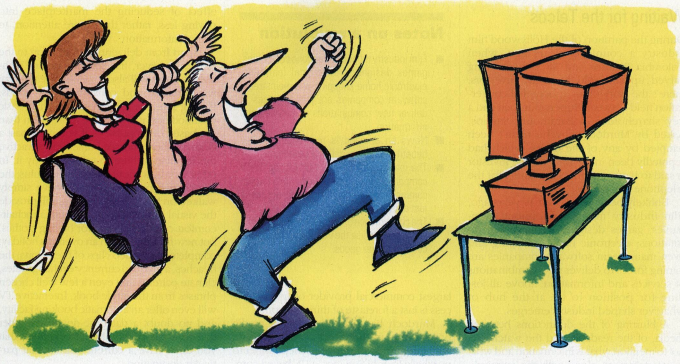
Key to the success of the proposition is digitisation, and Spindler estimates that by the end of the decade, 90 to 95 per cent of work will be capable of being digitised, stored, transported and reused. Information storage and retrieval in this way opens up the possibility of combining printed data with images, video and voice, delivering the information in a way which is more dynamic, more compelling. "When ideas have no physical boundaries, the concept of a physical place is less important," he says, referring to the breaking down of the traditional communal workplace structure and the emergence of the global village and distributed work practices and workgroup members.

Print, too, will converge with the ability to deliver information electronically, though Spindler asserts that it represents greater choice, rather than electronic replacement. "What we're talking about is options, rather than imposing electronic delivery. Co-ax can deliver the information, but customising the newspaper and delivering it electronically can in no way replace the experience to be gained by taking the newspaper and some toast and coffee out onto the porch and enjoying a leisurely breakfast, and we're not seeking to do that." Experiential considerations aside, ("Nobody recommends taking a jump off the Eiffel Tower just for the experience"), Spindler foreshadows a time when computers, telecommunications and printing and publishing technologies will merge and lose their distinct characteristics. Transparent technologies will deliver instant and ubiquitous information, becoming part of the fabric of social transactions. It will also bring a closer liaison between entertainment technologies and education technologies. "The example I like to use is of two little boys sitting in a park in Boston around 1776. One turns to the other and says "let's go down to see the hanging of the witches." The other says, "No, I'd rather go to my teacher's classroom and hear about the Kings and Queens of England." Now the story suggests that around that time, entertainment and education technologies were about even, but today, 217 years later, MTV has won outright! And it's only because the educators out there are still using slide overheads! The value of pictures over the printed word alone cannot be overstated. Convergence of these technologies will deliver information in a way which is much more compelling, and more meaningful."

Around about the time we achieve that aim, Spindler says, we will be looking, to all intents and purposes, at just one technology, based on an infrastructure of high-speed fibre-optic cable, linking services with people. Hospitals linked to homes, offices, educational and recreational facilities. "It is in the area of social services, the workplace, and the constantly changing field of education that we have a chance to make an impact."

Spindler's argument is that we must come to terms with the concept that teachers are more literally knowledge brokers, part of the ongoing process rather than absolute providers of knowledge, and we must recognise that rather than just selling commodities, such as Australia has done with wool and sheep, we must work on adding value, such as turning sand into silicon, and glass into fibre-optics. Only then, he asserts, will we be ready to take part in the information age and realise the abundant opportunities it represents.

"Australia is poised to benefit significantly from the developing reliance on such a technology infrastructure. Australians should take heart, for example, from the news that the Saudi Arabia telecommunications infrastructure is run by Australian Telecom, rather than, say, Bell South. Australia realised the importance of ISDN well before we did in the US. This is your opportunity to take the germ of a key information technology and make best advantage of the expertise you have."



Infotainment

How new technology will merge information and entertainment and deliver it everywhere.

BY HELEN DANCER

Infotainment, the synthesis of information and entertainment, or possibly more accurately, the collision of information as content with delivery mechanisms more commonly regarded as sources of entertainment. The television, the telephone, even video games – watch out! Pretty soon you may discover that shock of realising that they are useful as well as being fun. Wouldn't it be wonderful to be able to scroll the newspaper, or better still, have a database retrieve every morning newspaper's version of the Mabo debate, and compare the government's firm policy this week with its different undisputed stand last week, instead of having to grubby your fingers and muddle your mind sifting through the various tangents and side issues. Even more unthinkable, instead of the kids filling up their lives with bumbling Mario brothers or Sonic Hedgehogs, wouldn't we all rather they found something educational to be as compelling as the games? Infotainment should, if we're all diligent, prove to be as much a synthesis of the concepts, as simply the two words. But first a little background on who's sending this little surprise package down the line.

Waiting for the Telcos

During the partition of the Hollywood film industry a couple of years ago, when Colombia Pictures and MCA were being carved up and sold to canny investors, there's the story of an apocryphal conversation held between Rupert Murdoch and a key shareholder in Paramount Studios. Asked by Murdoch why he hadn't been tempted by any of the offers, which had reputedly been in the billions, the investor is said to have replied, "I'm waiting for the telephone companies."

Unlikely bedfellows even 10 years ago, film industry moguls, telephone companies, games designers, educational institutions, electronic home shopping and even mainstream software companies are joining forces to deliver new combinations of services and information, above all jostling for position to be at the hub of whatever shaped industry emerges.

A blurring of the distinctions between media, of the readable and the watchable, not to mention what is information and what is entertainment, along with the extraordinary partnerships that have been formed, confirm, if nothing else, that ubiquity is the key, and whether it be home shopping, or dial-up access to *The Times*, there's no such thing as a free connect, brother.

Product of the revolution

So what can we expect for all the positioning and jockeying at the top corporate echelons? Video, newspapers, stock market on demand, maybe beamed-in schoolwork, which is a better synthesis of learning and fun, by all accounts. Here too, strategic partnerships are part of the new order.

News on demand is regarded as a key benefit of the new delivery paradigm. Timely access to relevant information, or even alerts that the information exists, can mean a difference of literally millions of dollars in business. The ability to build subscriber profiles will mean that desktop delivery of relevant news becomes refined but flexible, allowing the subscriber to change their profile at any time, to take in new content or discontinue subjects that are no longer of interest.

Internet, the international online information service, is one of the first targets for companies and services wanting to take their talents to the people. Internet, which is largely used as a research and study medium, will soon be carried into the home via a television set, courtesy of an agreement between Internet provider Continental Cablevision and PSI, Performance Systems International. PSI will add Internet to the list of services offered by Continental Cablevision. The marriage of the third-largest cable TV company in the US to the country's largest commercial provider of Internet access is just a foretaste of things to come.

Notes on a revolution

- Film industry moguls, telephone companies, games designers, eductional institutes, electronic home shopping and mainstream software companies are joining forces to deliver new combinations of services and information.
- News on demand is regarded as a key benefit of the new delivery paradigm.
- The marriage of the third-largest cable TV company in the US to the country's largest commercial provider of Internet access is just a foretaste of things to come.
- The convergence of all technology types will also revolutionise the way we purchase and consume other goods.

Murdoch has planted his giant media boots firmly in the direct access industry, with intentions announced in September to purchase Delphi Services, a US-based computer-driven service offering subscribers instant access to news and other educational materials. Murdoch's vision is for an electronic newspaper which differs radically from the version of a newspaper that we have traditionally accepted. For a typical $US20, subscribers will be able to browse through a wider range of news, government reports, travel information and education, as well as using the service as a means of communicating directly with each other.

Another aspect to the electronic interchange is that the News Corporation subsidiary, publishing house, Harper Collins, will be able to take advantage of the new medium for the wealth of material at its disposal. News Corporation also owns interests in satellite TV services which beam programmes across Asia, and has, over the last several months, undertaken joint ventures with partners in the European, Mexican and South African markets, to expand its influence in the delivery of television services, and to guide and form the establishment of worldwide standards for digital television.

Electronic delivery of news, views and research material in a sense changes their structure and relative value, as instead of being a product with an intrinsic and discrete value, such as a newsprint-based newspaper, the same information, absorbed into the greater information mass of a PC or future-tech PCTV, to be compiled, compared and compressed, used and reused, makes it part of the value chain rather than the product. Infotainment might actually make a difference to the information we consume and the way we consume it. Conversely, and a more frightening prospect, it may have the effect of seducing the marketplace into paying less, rather than more attention, to critical information.

Apart from delivering information to the home, however, the convergence of technology types will also revolutionise the way we purchase and consume other goods. Buying patterns for items other than basic commodities, it is said, are more often than not based on impulse — if you walk past a clothing shop and see something attractive the impulse is there to try it and buy it. In other words, without the visual stimulus, the prospective purchaser would have simply walked on by. Home shopping will provide the visual stimulus, in full-screen, armchair-comfort colour, not only for buying clothes, but new furniture, even an overseas holiday, complete with video clips of the resorts, the beaches, a guide to currency exchange rates, climate patterns and even a few well chosen phrases from the guide book. Interactive TV will even offer an automatic booking facility, and no doubt a database-driven reminder that your passport is about to expire or that you don't have a current visa for that particular destination.

But supposing, just supposing, you actually wanted to walk out of your house to shop. Technology will be there as well, changing shopping and stock handling practices. IBM announced in May that it had entered a partnership with BlockBuster, of which one of the first projects would be to develop a system for the storage and retrieval of music. So instead of large stores based on expensive floor space, half filled with customers flicking through stacks of empty CD holders or cassette cases, a typical Virgin Futurestore may simply be a couple of multimedia booths with interactive touch screens. Customers could browse the music aurally as well as visually, make a selection and press the order button. The signal will be sent back to a giant file server on which is stored all the music that outlet is licensed to dispense, and the contents of that CD will be transmitted to the outlet, transferred onto a CD then and there, and a colour printer will output the CD sleeve and graphics. By the time the customer arrives at the checkout and surrenders the credit card, the newly pressed CD is ready to be handed over.

The implications of such a system are immense. Distribution, storage, stockholding and retail space will all be radically altered by the new delivery mechanism, as will buying patterns. Again, the purchase of music is shown to be an impulse. Stores lose many sales through not having an item in stock, if the purchase impulse is left unsatisfied, the chances of the person just forgetting about it are far higher than the incidence of him pursuing the impulse somewhere else. Since the music industry is so volatile, and requests are so diverse, it is estimated that the ability to stock (in a virtual sense), every

recording of every classical work or every album of every group translates into a quantum increase in sales.

As you might have expected, however, there are motivations other than increased sales and improved customer satisfaction. The system has a curious by-product, and becomes in itself a value-add opportunity. Logging who bought what, and when, it becomes a demographic database, not only on musical tastes, but spending habits and patterns — does she always use her Bankcard, do the over 70s always buy on pension day, do men in green ties always buy jazz? Do you catch the scent of Big Brother, brother? This information, compiled into reports and used to chart seasonal spending habits and price thresholds, becomes a product which marketing and research companies will find invaluable, and for which they will no doubt pay megabucks.

It is ironic to consider the business re-engineering that may ensue from electronic delivery of information with retail chains becoming research analysts — selling one set of product to one target market, and selling the by-product of that sale further back up the food chain.

Another aspect to the partnerships induced by the new convergence, is the potential to make learning fun. The interview with Michael Spindler (see side box) at least offers some hope that the opportunity exists for the convergence of games and education, of the software industry, the games designers and traditional educators, to work on materials which are more compelling, more informative and more mentally stimulating than either school or television have become. With the ability to delegate many mind processes to an electronic process, where decisions about and synthesis of information will be automatic, so it will be critical that technology exercises the other side of the equation and promotes mental dexterity, and educational materials provide the ideal forum for this to occur.

Intellectual property

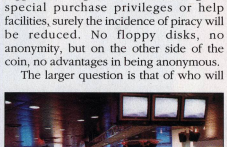
The new delivery mechanisms provide better service for customers, and greater protection for content owners. Who will bother recording a film from a live television broadcast if it is available every day of the week and every minute of every day? Video on demand is one of the most widely touted benefits of the new infotainment infrastructure. Certainly the data highway will be a road to nowhere for video rental parlours, and even manufacturers of video recorders. Given an efficient structure, the pricepoint of subscribing to a service which will both provide video on demand or record realtime TV for playback at a future time, may well be less than the depreciated cost of a one-time purchase of a video recorder.

If the structure of the storage and delivery of music CDs is set to radically change, doesn't that necessarily imply a change in the cost structure, and result in lower-priced product to the consumer? And if the price threshold is coprectly assessed, and delivery is guaranteed, what benefit will illegal copying bring?

If journals, newspapers and magazines are available onscreen, on time, on demand, and the information contained therein is synthesised and categorised as being relevant to the subscriber, the media monitoring and clippings reproduction industry, which profits from lifting the work of news analysts and journalists, compiling the information and selling it to clients, will suddenly find itself without a marketplace.

If software is delivered into the home with a single phone call, and the user is logged as a registered owner, and given special purchase privileges or help facilities, surely the incidence of piracy will be reduced. No floppy disks, no anonymity, but on the other side of the coin, no advantages in being anonymous.

The larger question is that of who will



Virgin Megastores: down-the-line purchasing?

undertake to, or indeed be capable of protecting content developers from the owners of the delivery mechanism? The only model we have to compare is that of book publishing, where conglomerate delivery agents, also known as publishing houses, control and regulate the content that is distributed to the market place. Content developers or providers are paid a royalty, or a fee, and subscribers are the people who buy the books. That model is not at all appropriate in the new scheme, since it reduces to a common value the myriad products which will become available — from shopping to the stock market — (although maybe they are not so different except in commodity and scale).

As with the ability to control information, these are human issues, requiring consultation and legislation, and questions which technology alone cannot hope to address. In the meantime, pass me the remote control — a girl's got to shop!

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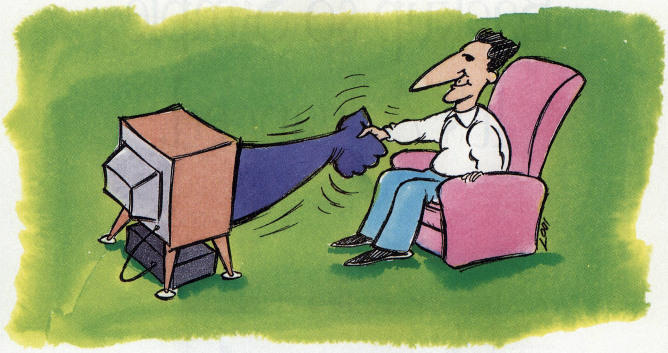
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Interactive television

Say goodbye to the idiot box!

BY IAN PETER

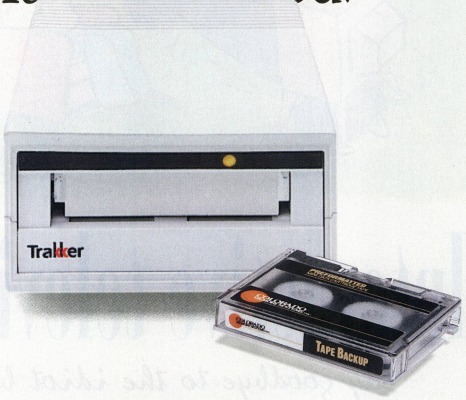
The technology for interactive TV offers a fascinating series of options and mergers of existing technologies into a simple, intuitive system that will integrate the functions of television and many parts of the computer industry. Basically, we can look at three areas in the emerging technology – hardware, software and delivery.

In terms of delivery, the difference between television as we know it and interactive television is the change from a one-way (high-bandwidth-in) function to a two-way (high-bandwidth-in, low-bandwidth-out) function.

In terms of Australian adaptation, we can't be sure yet which delivery possibilities will be used. In Sweden, for instance, people are looking at satellite transmission for bandwidth in, linked with cable for bandwidth out. In the USA, where cable is well established, cable will be used for both signals.

In Australia anything could happen at this stage, and much depends on the fate of the pay-TV licences. If major interested parties do not secure these licences for a satellite delivery service, they are likely to opt for a cable service, perhaps based on optical-fibre networks. However, video compression technology has advanced so much that delivery is now possible over the ordinary Australian telephone line. This option is also being investigated. An interesting sideline to all of this is that the Broadcasting Act would apply if the services are satellite based, but may not apply if they are cable based. So look out for some interesting legal changes as well.

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The hardware component attracting most interest is the 'black box' which will control interactive television. This also seems the most difficult part of the whole system to develop.

The black box is essentially a device capable of choosing options from a wide range of services, and is essentially the CPU of interactive TV. Among its functions will be the need to compress and decompress digital signals, and considerable security functions for online banking and shopping. It is unlikely to be a programmable device, so the functionality is a very interesting consideration. It is also likely to include a quite considerable memory application for recording and replay of programs, and a small printer for receipts and dockets.

The black box will connect to the delivery mechanism at one end, and the screen at the other. There seem to be comparatively few issues in merging the television screen and the computer screen. More interesting is to speculate on the control devices which will be offered for the home user.

Most likely the black box will have some sort of serial port into which palmtops and personal computers can connect for some of the online information and communication functions. However, the majority of users will have an infrared device of some sort to enable channel switching, choosing options and sending messages. It's probably best to imagine this as some sort of combination of a television remote control, a joystick, a mouse, and a simple messaging device, which may be a handwriting interface or a simple keyboard of some sort.

The software part is most interesting, and Microsoft is but one of many players looking at this.

Very little software exists at the home-viewer end, but significant software developments will be needed for the interactive TV applications.

What we can imagine is a television screen with a series of windows-like applications or boxes to enable viewer choice. For instance, a few clicks on menus will enable us to obtain local rather than continental weather forecasts during news segments.

Other options will enable us to choose news updates at any time of the day, or a wide range of specialised news and information services, and there will be channels devoted to information services, online banking and shopping, and surely TAB and video hire.

Other applications are numerous, and eventually hundreds of services will be available, with a potential list as long as the combined imagination of the media, computing and communications industries. Choosing camera angles during sporting broadcasts; getting updates on movies when you tune in late; controlling instant replays by storing them in the black box's memory; online games; buying and downloading software; ordering a pizza; electronic mail; the list goes on and on.

All this sounds a little like pie in the sky, but consider this: in the USA, investment in interactive TV is rumoured to be at a minimum level of $30 billion. Major players who have announced their commitments include Microsoft, Time Warner, Telecommunications Inc, Intel, Apple, Silicon Graphics and Hewlett-Packard, to name a few. And in Australia, a great level of interest exists with the Packer and Murdoch media empires, and both Telecom and Optus.

All of which adds up to a very significant commitment to a media which will change the face of both the broadcasting and computing industries.

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4th Annual Printer Review

BY BILL

Laser printers for $1200, stunning colour for under $1500, faster performance, higher resolution, better network management: you'll find them all among the printers we tested for this year's annual block-buster, which begins this month with mainstream lasers and portable printers, and continues next month with shared lasers, inkjet, dot matrix and colour printers.

Twelve hundred dollars for a laser printer. Since last year's printer issue hit the stands, we've come from the lowest price laser costing $1800 to the $1199 Brother HL-6 of today – a 33 per cent reduction. And street prices are even lower. The low-cost 4-page-per-minute laser printer that costs $1200 to $1600 and sells for less on the street represents the most important of a half-dozen or so major trends among the printers we reviewed this year.



Photograph by Geoff Spear

The Australian printer market

AUSTRALIAN PRINTER SALES, 1992 TO 1994			
Units shipped	**1992**	**1993**	**1994**
Dot matrix	270.2	271.4	248.0
Inkjet	91.4	160.0	203.7
Laser	91.3	126.8	142.7
Other	10.9	8.4	8.9
Total sales	463.8	566.6	603.3

Sales figures for 1993 and 1994 are projected (in '000s)
Source: IDC

LEADING MANUFACTURERS, 1992			
	Dot matrix	**Inkjet**	**Laser**
1	Epson	Hewlett-Packard	Hewlett-Packard
2	Star	Canon	Lexmark
3	Panasonic	Apple	Apple
4	Fujitsu	Epson	Texas Instruments
5	Citizen	Kodak	Epson

Source: IDC (based on 1992 unit sales)

Some other trends include: more 600-dot-per-inch laser printers, further segmentation of the laser printer market into high-speed (12ppm and up) network lasers and slow (6ppm and below) personal lasers, energy-efficient lasers, sub-$2300 PostScript Level 2 printers, tremendous sales growth among inkjet printers, resilience of the supposedly fading dot matrix printer market, and tremendous improvement in quality among colour printers. This year, because of the number of printers we looked at, we've split our Annual Printer Review over two months. In this issue, Part 1, we compare mainstream laser printers and portable printing, and continue in January 1993 with Part II, and look at high-end shared laser printers, as well as inkjet, colour and dot matrix printers.

Market trends

Australian printer sales will increase 22 per cent this year, reaching 566,000 units, according to IDC. (In comparison, IDC projects about 825,000 PC sales this year). Projected activity in individual segments of the printer market ranges from sensational (inkjet printers, up 43 per cent and laser printers, up 39 per cent) to stagnant (dot matrix printers up less than 0.01 per cent). But the dot matrix market is far from dead; in unit volume, it should still account for a shade under 48 per cent of printers that will be sold domestically in 1993. The biggest growth and the most sales are happening at the high and low ends of the printer market among high-speed network laser printers and affordable personal laser, inkjet, and dot matrix printers. Keep in mind that although prices are listed, many printers will sell for much less on the street — expecially in the lower end of the market.

Lasers: who can catch up?

The majority of the mainstream laser printers we tested have engines rated at 4, 5, or 6ppm and their prices are well below $3000.

Hewlett-Packard brought out two sets of 4ppm printers this year: the 300dpi HP LaserJet 4L (PCL 5) and HP LaserJet 4ML (PostScript and PCL 5) are based on the Canon PC engine. The more recent 600dpi HP LaserJet 4P (PCL 5) and 4MP (PostScript and PCL 5) are based on the Canon PX II engine. The LaserJet 4L sells for about $1470. The LaserJet 4P sells for about $2195, and the 8ppm, 600dpi HP LaserJet 4, introduced last year, sells for $3472.

HP's 4ppm printers include a variety of bells and whistles, including HP's Memory Enhancement Technology, a data-compression technique that lets you print a full page of PCL graphics with just 1M of printer memory; a draft mode, which uses half the usual amount of toner; and better two-way communication between printer and host PC.

As a group, laser printers have become even more compact, quiet, and energy-efficient. To reduce footprints (the area the machine occupies on the desktop), most lasers now have paper drawers that slide completely inside.

Microsoft's TrueType scalable-font technology makes PostScript less of a must-have for business users. But for users sending material to typesetters or film recorders, there's still a strong comfort factor in using Adobe-branded PostScript. Two printers, Hewlett-Packard 4ML and Digital Equipment Corporation's DECLaser 1152 offer the more capable PostScript Level 2 at list prices of under $2300.

Colour printers

Colour printers that produced great output used to cost $6000 to over $20,000 and require Adobe PostScript. They also used thermal wax transfer, solid-ink (phase change), or thermal dye transfer technology. These technologies have improved in quality this year, but they're being challenged by a less expensive alternative: the inkjet. The PCL-only HP DeskJet 1200C ($3069) and PostScript-capable HP DeskJet 1200C/PS ($4135) are inkjet printers that produce excellent business graphics as well as high-quality monochrome output, meaning that one device can be both a monochrome and colour printer without sacrificing quality either way.

Inkjet: monochrome for now

Inkjets are $600 less expensive than the cheapest laser printers, which means that you can buy one from around $500.

You get almost laser quality for less than laser prices, though per-page costs are higher. Five of the six inkjet printers reviewed here are monochrome-only. The sixth is a returning Editors' Choice, the $938 HP DeskJet 550C. (The only other new colour inkjet printers this year are also from HP. Since they are priced more comparably with units based on traditional colour technologies like thermal wax transfer, they are in the Colour Printers section.)

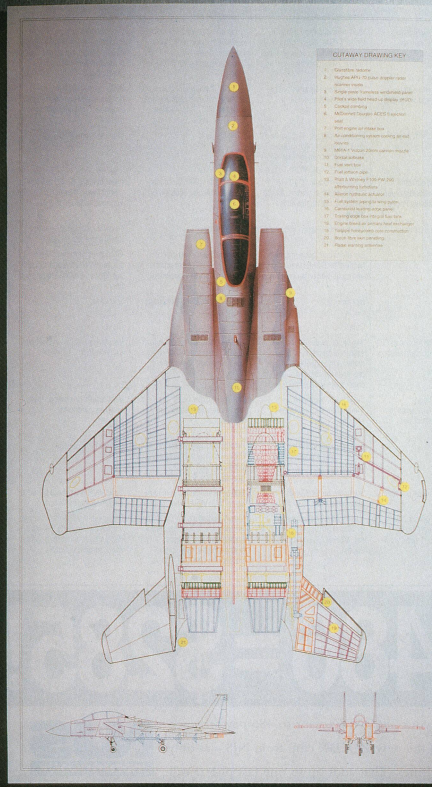
We expect the popularity of inkjets to grow because they can provide decent colour capabilities or tabloid-size (11 by 17 in) output for prices only incrementally higher than the cost of letter-size monochrome printers. Traditional players in the inkjet market — HP and Canon — were joined this year by Epson, Lexmark, Texas Instruments and Brother. Expect other printer manufacturers to be in the market soon.

Dot matrix

Since 1990, industry analysts have said dot matrix sales would peak and then begin to fall the following year. This year, they're almost right with sales almost identical to last year. But it will be a slow decline.

There's little new in the way of technology. You've seen the scalable fonts and low-noise technologies before. Advances in cost engineering, however, have brought the cost of 24-pin printers to less than $450 and 9-pin-printer price tags down to almost $200. If you want the lowest per-page costs, or if you want to print forms, dot matrix is still the way to go.

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JWT HPC 296

Print technologies: how to decide

This summary outlines the pros and cons of the five major printer categories. These comments apply to most printers withing each category; some will fall outside. High-end colour inkjet printers such as the HP DeskJet 1200C should also be considered colour printers. The cost per page does not included paper cost. The speeds of laser and dot matrix printers are not directly comparable, but a rough rule of thumb is that one page per minute (ppm) from a laser printer equals 30 characters per second (cps) printing a full page of double-spaced text, or 60cps printing single-spaced text.

	Dot matrix	Inkjet	Personal laser	Shared laser	Colour
Pros	Inexpensive, with low-cost output. Can handle multipart forms and wide paper	Quite, compact, inexpensive — $600 to $900 less than the cheapest laser. Some print up to 16 by 22 inches.	High print quality, very quiet. Under $1500 prices for basic models, meaning you can have one on every desktop.	Good quality. Very fast, especially with direct network hookups. Some handle 11 by 17in paper and have multiple bins.	High-quality colour output at high resolutions. Ideal for business graphics. Output can sometimes approximate colour photographs.
Cons	Noisy. Average print quality; graphics show banding. Few built in fonts.	High per-page costs. Occassional streaking and smudging.	Significantly higher per-page cost than with dot matrix printers.	Difficult installation. Needs and internal network card to reach full potential. Output not at users fingertips.	Bulky, extremely slow, high hardware and per-page costs, output not quite photograph quality.
Speed	Personal models, 25 to 200cps; forms printers, to 300cps. Printing quality mode reduces speed.	300 to 100cps. Quality-mode speed decrease is less than that of dat matrix.	Personal models, 4 to 8ppm; desktop models, 6 to 10ppm. Need processors for fast graphics performance.	12 to 30ppm	Usually 2ppm or slower.
Cost	Personal models, $300 to $1000; heavy-duty models, $1000 to $4000; line printer emulators, $10,000 to $20,000	Monochrome and portable models, $500 to $1500; colour models, $1500 and up. Prices are falling fast.	Personal models, $1100 to $3000; desktop models, $1300 to $8000. PostScript adds $500+.	$3000 to $15,000. Direct network connection adds $400+.	Inkjet models, $1500 to $7000; thermal wax, thermal dye, solid ink models, $5000 to $30,000.
Cost per page	Under 1 cent	4 to 8 cents (some as low as 2 cents).	1 to 5 cents (3 cents is typical).	1 to 3 cents.	50 cents to 1 dollar (thermal dye is more expensive).
Output quality	24-pin quality mode, moderately good; 9-pin mode, fair. Quality falls off as ribbon ages.	Almost laser-quality.	Excellent text, good graphics. Many offer 600dpi resolution and resolution enhancement.	Excellent text, good graphics. Many offer 600dpi resolution and resolution enhancement.	Vibrant inkjet thermal wax output, saturated thermal dye output. Many have trouble printing fine lines.
Colour	Inexpensive upgrade or special version.	Some models.	Not available.	Only with the QMS ColourScript Laser 1000.	Standard.
Noise	Loud; slow in quite mode.	Virtually silent.	Quiet.	Quiet.	Quiet.
Size	Narrow carriage models fit easily on desktop. Some small enough to take on the road.	Very small, except for some models with horizontal paper trays.	4 to 8ppm models, footprint slightly larger than letter-size paper. 8 to 12ppm models are too large for desktops. Internal paper trays reduce footprint.	Usually need separate table or stand, but some barely larger than personal laser printers.	Very bulky and can overwhelm a small office.
Paper	Tractor-feed or continuous multipart forms, cut sheets.	Cut sheets, overhead transparencies, labels, envelopes. Porous stock not recommentded.	Cut sheets, overhead transparencies, labels, envelopes.	Cut sheets, overhead transparencies, labels, envelopes.	Best results on coated stock and transparencies.
Common options	Cut-sheet feeder, colour upgrade, Mylar ('carbon') single-strike ribbon.	None.	Second paper cassette, envelope feeer, duplexer, PostScript.	Additional paper cassettes, duplexer, internal network card, duplexer, hard disk (for font storage), PostSctipt.	Network interfaces.
Energy efficiency	Naturally efficient.	Most energy-efficient printing technology.	Some are under 30 watts when idle. Others use 30 to 100 watts.	500 or more watts when idle; up to 1000 watts when printing.	Typically idle at about 50 watts. Power-saving models rare.
Future outlook	9-pin market fading; 24-pin market dropping off. Dot matrix market still makes up half of total printer sales.	Fastest growth. Will be the largest market segment by 1996. More tabloid-size colour models coming.	4 to 6ppm market growing fastest. 8 to 10ppm sales declining. Market moving toward 600dpi.	Growth outstrips that of 8 to 10ppm lasers. Look for moare paper-handling options, better remote management, low-power rest odes.	Prices falling. Thermal dye may match photo quality. Inkjets are beginning to compete as professional graphics printers.

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A compact personal printer, it's also packed with features. A built-in paper feeder loads up to 100 sheets automatically. You can even feed it envelopes, easily from the top.

Nine built-in fonts, four of which are scalable, plus the enhanced graphics, ensures a professional look any business would be proud of.

Whisper quiet operation means you can talk on the phone while you're printing.

It's fast too, 180 cps in letter quality mode.

Running costs are also reduced. The result of a permanent print head. (Other ink-jet printers have disposable ones.) So it's friendlier on the environment and your wallet.

It even tells you when it's running low on ink, with a friendly blink.

Fortunately, while its features and print quality are more like those of the bigger printers, its price is not.

In fact, you'll find the Stylus 800 more affordable than many printers with yesterday's technology.

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Benchmark tests: printers

As printer features evolve, so do the PC Labs printer tests. This year the extensive battery of tests have been expanded and tuned so they better address emerging trends, such as 600-dot-per-inch laser printers, support for Adobe PostScript Level 2 or Level 2 PostScript emulators, and power-saving features.

Shown here are some components of the tests used to judge printer performance and output quality. Many of these tests, such as the Arthur D. Author letter used to measure text speed, remain unchanged from past years. Others, including the Lotus 1-2-3 for Windows application test, are new. In 'How to Read the Printer Guides' (below), we describe the methods used to derive performance scores and judge output quality. For easy reference, we've included a sample printer output guide — a compilation of price and features, graphics and text samples, and graphics and text printing performance-test results.

New this year is our Power Consumption test, for which we use a Dranetz Series 808 Electric Power Demand Analyzer to record each printer's energy usage when printing, idle, and in power-saving sleep mode (if one is provided). We report the results of the power-usage tests alongside test-results charts. We also checked to see whether the printers were compatible with HP PCL 4, HP PCL 5, and Adobe PostScript Level 1 and Level 2, using tests that stress both common and infrequently used features of these page-description languages to uncover limitations in each manufacturer's implementation.

We discuss these findings, when appropriate, in the printer reviews.

Test environment

All tests were conducted on a Compaq Deskpro 486/33M equipped with 8M of RAM and a 310M hard disk. For Windows applications tests, Windows was installed in its default configuration, including a 2M SmartDrive cache. Virtual memory was turned off to eliminate effects of disk spooling, and the Windows Print Manager was bypassed to avoid introducing additional overhead. We conducted all the printer speed tests via the parallel port.

Graphics speed and CorelDRAW tests

We use the same page of graphics for both the Graphics Speed test and the CorelDRAW Windows application test. The page at right was created in CorelDRAW; for the CorelDRAW test we time the printer as it produces this page from the application using the supplied Microsoft Windows driver. For the Graphics Speed test we time the printer as it produces the same page from a print file sent directly from DOS.

This page is also useful as a guide to the printer's output quality. In the half-tone image, we look for clarity and reproduction of fine detail in highlights and shadows. We use the horizontal and vertical greyscales to judge the printer's ability to reproduce different grey levels. The hair-line rule rotated in 10-degree increments demonstrates the printer's ability to maintain a consistent line weight at varying rotations. The star-shaped figure at the upper right helps us check fine-edge quality.

New this year is our Power Consumption test [which will] record each printer's energy usage when printing, idle, and in power-saving sleep mode.

Word for Windows test

Shown above is one page of the Word for Windows test document we use to test text-printing speed under Microsoft Windows. This document contains Arial and Times New Roman TrueType fonts in different sizes and styles.

How to Read the Printer Guides

Performance test results
These results show how quickly the printer produces output. For dot matrix and ink jet printers, we report the text speed in both draft and quality modes. For laser printers, we show the performance in both HP PCL and PostScript (if supported). To allow meaningful comparisons, results for laser printers indicate performance at 300-dot-per-inch resolution, even if the printers support higher resolutions.

Graphics output
The photo shows how well the printer reproduces halftones.

Text output
This provides a sample of the printer's text output for a selection of built-in typefaces.

Gray-scale or color output
This bar consists of six shades of gray for monochrome printers. For color printers, the bar displays six shades of gray and six colors.

Line art
This shows how well the printer handles lines of increasingly large pixel widths, as well as curves.

APC MAGAZINE EDITORS' CHOICE

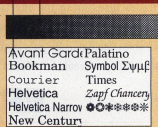
HP LaserJet 4M

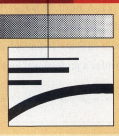
8-ppm laser printer (Canon EX engine) with 600-dpi output, Adobe PostScript Level 2, enhanced HP PCL 5

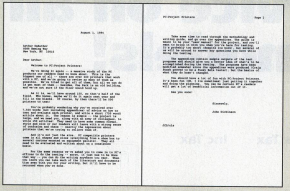
PCL Text Speed: 8.0 ppm
PCL Graphics Speed: 2.8 ppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 5.9 ppm
CorelDRAW: 1.0 ppm
Lotus 1-2-3 for Windows: 2.9 ppm

PS Text Speed: 7.8 ppm
PS Graphics Speed: 1.3 ppm
PS WINDOWS APPLICATIONS:
Word for Windows: 6.0 ppm
CorelDRAW: 1.3 ppm
Lotus 1-2-3 for Windows: 3.5 ppm

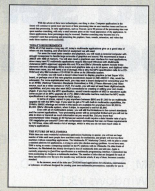




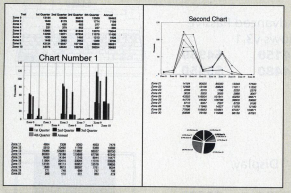




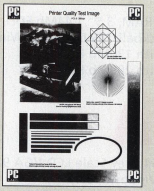
Text Speed test



Word for Windows test



Lotus 1-2-3 for Windows test



Graphics and CorelDRAW tests.

We print a two-page document for dot matrix and inkjet printers. For laser printers, we print a 10-page document, which reduces the effect of the delay typically incurred while the printer prepares the first page. Since colour printers are not generally intended for text-only output, we have omitted the Word for Windows test in the colour-printers section.

Test Speed test

The Text Speed test uses the same Arthur D. Author letter that we've used since our first printer issue, four years ago. This test, which we run from DOS, provides a good indication of the printer's raw engine speed. Since we haven't changed the test, you can compare the speed result against those in all previous printer reviews.

For dot matrix and inkjet printers, we print the two-page letter once; for page printers, we print the letter 10 times as a single 20-page document, which reduces the significance of the delay that occurs when the printer produces the first page.

Since expensive colour printers typically are not used for printing unformatted text, we did not run this test on the printers in our colour section.

Lotus 1-2-3 for Windows test

One of the new tests in the suite this year is this two-page spreadsheet with embedded graphics, created in Lotus 1-2-3 for Windows. This document shows the printer's performance when producing typical business graphics from within Windows.

Green printers

The printers in this year's report use fewer resources and less energy than their predecessors. Partly that's due to the US Environmental Protection Agency, which now certifies as Energy Star compliant printers that use less than 30 to 45 watts when idle. We conducted our own power-consumption tests on laser and colour printers this year; results are reported alongside performance numbers in each section. (We didn't test inkjet or dot matrix printers because they're naturally efficient already.)

If your idea of conservation is saving money on per-page costs, consider the 18ppm Kyocera Ecosys Printer FS-3500 (see Shared Lasers, next month). Because of its long-life amorphous silicon photoconductor drums, costs run about 1.5 cents per page (plus paper costs). This compares with a laser printer's typical per-page cost of three cents.

Future trends

Looking ahead to 1994, you can expect to see virtually every laser printer have a sleep mode that meets US Energy Star requirements. A power-saving mode isn't that hard to implement, and it will be a requirement for printers sold to the US government. This feature will flow-on to printers sold here.

More printers will also include high-speed bidirectional parallel ports. The IEEE 1284 specification combines all the high-speed parallel-port initiatives of the past two years under one compatible master spec. You'll be able to send data to the printer 10 or more times faster than you can today, and you'll get far better on-screen status information.

You might also see printers with inexpensive infrared receivers built in — a technology pioneered by HP. Building them in costs only a few dollars.

About the report

To be included in this report running this month and January 1994, printers had to be new since last year's blockbuster (December, 1992). We also brought back several of last year's Editors' Choice picks, most notably the HP LaserJet 4M, to see how they stacked up against the 1993 contenders.

The review sections are arranged in this order. In this issue:

- Mainstream laser and LED page printers (rated for less than 12ppm). Throughout this issue, when we say laser, we use it in the colloquial sense that most users do, regardless of the technology under the hood.
- Portable printers

In next month's issue, we will continue the report. The sections covered are:

- Shared, or networkable, laser printers (rated for 12ppm and up).
- Colour printers.
- Inkjet printers, including one that prints capably in colour: the DeskJet 550C.
- Dot matrix printers, ranging from affordable personal printers to heavy-duty forms printers.

Within each section, reviews are arranged alphabetically by vendor name. Multiple printers from the same vendor appear under a single heading, although we always test printers individually. Essentially identical models from different vendors are reviewed together and appear under the name of the vendor that is first alphabetically.

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NEC

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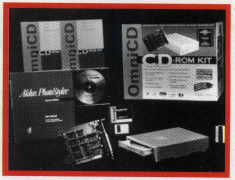
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- Software Toolworks MPC Encyclopedia
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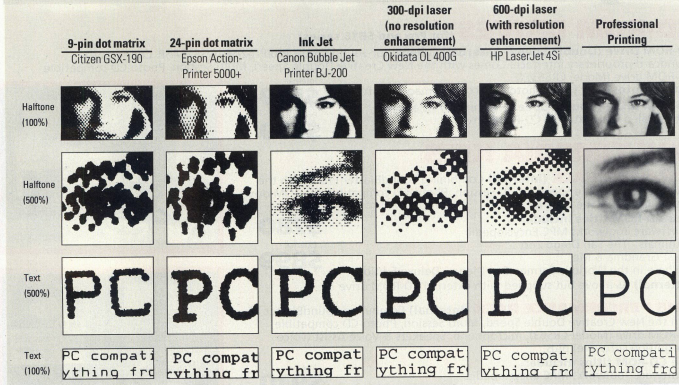
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Print technologies: comparing the output

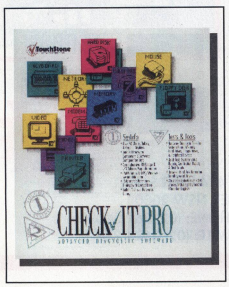
This illustration shows respresentative output samples for the major printer types and for a professional offset printing process. A halftone image and a text sample are reproduced here at the original size and five times the original size.



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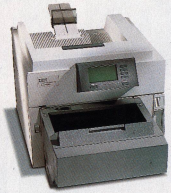
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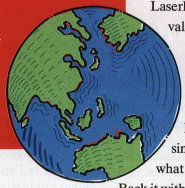
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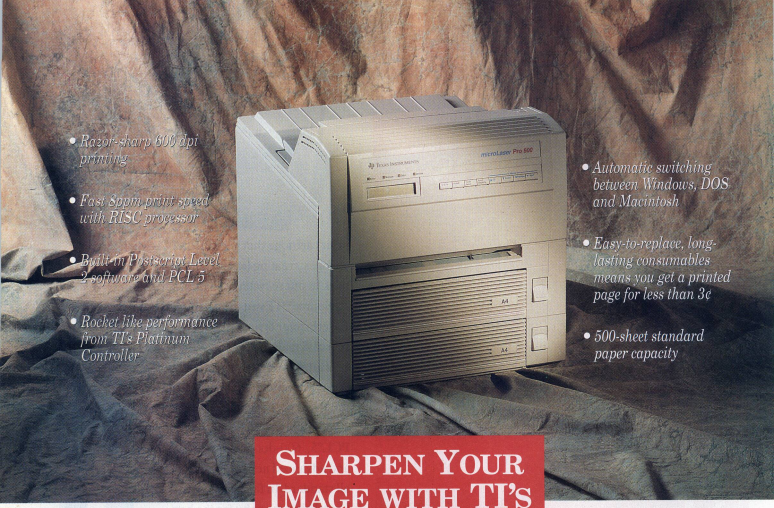
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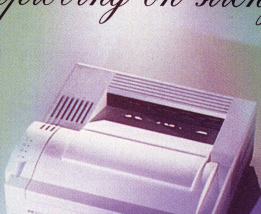
microMarc *rated "best value" inkjet printer, PC User*

EXTENDING YOUR REACH WITH INNOVATION

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Mainstream lasers

Improving on strength



BY ALFRED POOR

In last year's review, the average list price of mainstream laser printers reviewed was $3607. This year, the average price has dropped to under $4000. And sheet prices are lower still. But low price isn't the only appeal of these 28 printers. Better output quality, plenty of performance levels, energy saving features, and unobtrusive design are just as welcome.

THE BIG NEWS in mainstream lasers this year is savings – not just in terms of purchase price, but in terms of toner, paper, electrical power, and even user time and effort. As we approach the inevitable limit of what manufacturers can afford to charge for seven to 25 kilograms of high-tech stuff, vendors are seeking a competitive edge by cramming more efficiency and ease of use into the same-size package, making their printers even more valuable.

The most apparent evidence of cost-cutting is the prices of this year's crop of printers. There are three units here with price tags below $1500, led by the Brother HL-6 ($1199), the HP LaserJet 4L ($1470) and the TI MicroWriter ($1485). These lowest-cost lasers are the best evidence of the plummeting prices across the mainstream laser market.

This is also the first year we saw true Adobe PostScript Level 2 in a printer listing below $2300. Both the DEClaser 1152 ($2051) and the HP LaserJet 4ML ($2200), reviewed here, offer this feature.

There's more to the story than low prices, however. Low-speed (4, , and 6-pages-per-minute) printers are grabbing a larger share of the marketplace. According to IDC, the 6ppm-and-below range sold this year was only slightly less (about 10 per cent) than the traditional 7 to 11ppm models and we can expect these positions to be reversed next year. And though sales of mid-speed machines are projected to remain fairly flat, the sales of low-speed lasers is expected to double by 1997.

One reason for this rapid growth at the low end is that people are possessive about their printers. They would rather have a slower printer on their desks than shared access to a faster one down the hall. Since these new prices make it possible to buy as many as five or more personal printers for the price of one shared printer, there isn't that much more cost involved in giving people their own printers.

Another factor is the rapid growth in the small-office/home-office market. According to IDC, that market is accounting for the majority of 4 to 6ppm laser printer sales, and the needs of users in small offices have a major impact on the direction of product development efforts.

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Photograph by Geoff Spear

Computer EDITORS CHOICE

- **Low-cost (PCL only) . . . Okidata OL400e**
- **Low-cost (PostScript) . . . TI microWriter**
- **General-purpose (PCL only) . . . HP LaserJet 4L, HP LaserJet 4P**
- **General-purpose (PostScript) . . . HP LaserJet 4M, TI microLaser Pro 600**
- **A3-size output . . . QMS 860 Print System**

In the past year mainstream laser printers have improved in almost every way imaginable, offering — among other things — speedier performance, crisper output, lower energy consumption, smaller footprints, and PostScript Level 2 support. The 28 printers here offer resolutions from 300 to 1200 dots per inch and performance from 4 to 10 pages per minute. If you're seeking something even faster, or if you demand extremely versatile paper handling, turn to the Network Lasers section of this story for more choices.

Under $2000

The real excitement in laser printers this year is price. The cheapest machine in the group we tested was the 6ppm Brother HL-6 at $1199. This 300dpi personal laser printer will suit the budget-conscious. It lacks any form of resolution enhancement, and comes with only 512K of RAM (expandable to 4.5M).

The 4ppm Okidata OL400e ($1699) is also designed to brings basic laser printing to your desktop. It also includes only 512K of memory and doesn't offer any form of resolution enhancement, but if you want great laser quality, you won't find a better bargain. The OL400e doesn't skimp on performance either: during testing, it beat many of the more expensive models with 4ppm engines.

And if your tastes run to PostScript, consider the TI microWriter ($1485), which offers a true Adobe PostScript interpreter — and for a better price than some comparable printers without PostScript support. This unit (with 2M of RAM) turned in respectable test scores and produced acceptable output.

General-purpose winners

Hewlett-Packard stayed a step ahead of the competition this year with two pairs of printers that offer a variety of new features. Among them are power-saving rest modes, toner-conserving draft modes, and memory-enhancement technology that improves handling of complex PCL graphics in limited RAM. Enhanced status reporting indicates job progress and the precise location of paper jams, all from the console of your PC — a capability found in Microsoft's Windows Printing System cartridge for the HP LaserJet II and 3 series.

The best bargains among HP's new printers are the 300dpi HP LaserJet 4L ($1470) and 600dpi HP LaserJet 4P ($2199), both PCL-only 4ppm models with Resolution Enhancement Technology. The HP LaserJet 4M ($4456) is a repeat Editor's Choice winner from last year, again distinguishing itself with impressive 8ppm performance, resolution-enhanced 600dpi output, and an Adobe PostScript Level 2 interpreter. The PCL-only HP LaserJet 4, also an Editor's Choice pick last year, is still available, now priced at $3445.

An alternative to the LaserJet 4M is the TI microLaser Pro 600 ($3448) from Texas Instruments. This unit doesn't offer all the features of the LaserJet 4M; it prints at 600dpi only in PostScript emulation, doesn't offer resolution enhancement and includes fewer standard fonts. Moreover, its performance isn't as strong. But it does produce superb output, and it sells for $1000 less than the HP unit.

Tabloid-size output

Laser printers capable of producing 11 by 17in output have always commanded a substantial price premium, and that's not likely to change anytime soon. For a price tag of $9674, though, the QMS 860 Print System offers plenty to like: an 8ppm engine, 600dpi output, and QMS' own PostScript Level 2 clone. The QMS 860 had the best output and fastest overall performance among the A3-size printers we tested.

A3-size printing capability is more common among higher-speed printers. For more choices in this area, turn to our Network Lasers section.

Honourable mention

Laser printers have diversified remarkably in the past year, leaving plenty of room for differentiation. A number of the units we tested offered unusual capabilities that earn them honorable mention. But these units didn't offer the strength demonstrated by the winners.

The IBM 4039 10R Duplex is a 10ppm printer that can print on both sides of a page. It offers Lexmark's PostScript emulation, delivers top performance, and features the easiest-to-use control panel around. With a price tag of $5242, it's also one of the least expensive ways to generate two-sided output.

The HP LaserJet 4ML ($2200) and HP LaserJet 4MP ($2719) are PostScript-enhanced versions of the LaserJet 4L and LaserJet 4P, respectively. With their somewhat high price tags, the LaserJet 4ML and LaserJet 4MP can't compete on price with the TI microWriter and TI microLaser Pro 600. But they're extremely capable printers, and if you're willing to spend a few hundred dollars extra for their additional features (and venerable HP name) you won't be disappointed.

Likewise the Brother HL-6 laser printer. Although this 6ppm unit can't match the design features and performance capabilities of the 4ppm Okidata OL400e, for $400 less it deserves an honourable mention and is worth looking at if you want to save money on a personal laser printer.

Whatever the reason, there are increasingly more low-speed printers to consider. This Mainstream Laser section covers any printer that is capable of up to 11ppm, but out of the field of 28 machines reviewed here, 15 have engine speeds of 4, 5, or 6ppm.

More for less

Since falling prices tend to make price differentials smaller, vendors have been looking for ways to make their products stand out. One way is to simply add features. For example, of the 27 printers here that offer support for PCL (the HP LaserJet page description language), 13 support the more powerful and flexible PCL 5 version of the language. Of the 18 printers that come standard with PostScript or one of its clones, seven support the more capable and faster Level 2 version of Adobe PostScript.

Sixteen of the 28 printers here offer resolution that is better than 300 dots per inch, either through higher engine resolution, enhanced image resolution or a combination of both. Four of the printers we looked at even claim 1200dpi resolution. Memory and processing power are also differentiating features.

Twelve of the 28 printers that are reviewed here come with 4M or more of memory. Eighteen of them are powered by RISC processors for added performance; the Intel i80960 chip was the most popular RISC chip with seven printers using it. Printers with RISC processors tended to output graphics two to three times faster than those with chips based on CISC technologies. Three printers here take A3-size (11 by 17in or tabloid-size) paper and range in price from $8995 to $17,995.

But if manufacturers appear to be concerned about giving customers more printer for the money, they also seem to be concerned about providing a printer that can continue to create savings after the initial purchase, either by offering duplexing capabilities or reducing per-page and energy costs.

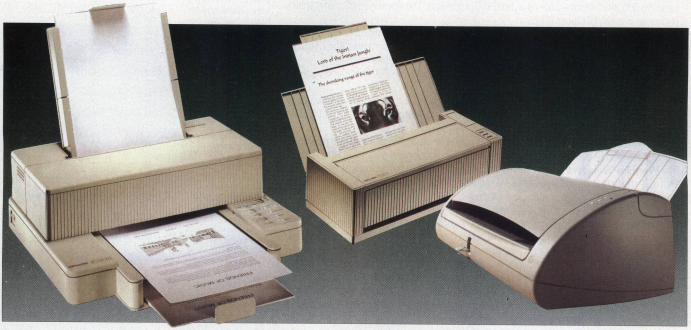
Duplexing lets you print on both sides of a sheet of paper. A typical page of laser-

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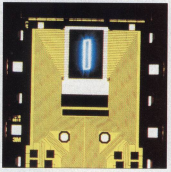
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Benchmark tests: mainstream laser printers

The Lexmark IBM 4039 10R and IBM 4039 10R Duplex had the best performance in HP PCL emulation, thanks to their fast, 10-page-per-minute engines. Overhead introduced by the duplexer is evident in the latter model's comparatively lower Text Speed scores. The 8ppm HP LaserJet 4M was consistently among the leaders in both HP PCL and PostScript emulations, though on some of our PostScript-mode tests it was edged out by the TI microLaser Pro 600. The fastest PostScript graphics performers were the HP LaserJet4M, the LaserMaster LMU 1200XL-O Plain-Paper Typesetter, and the Texas Instruments MicroLaser Pro 600, all of which are based on fast RISC processors. The slowest PostScript graphics performer was the DECLaser 1152.

The HP LaserJet 4L, HP LaserJet 4ML, HP LaserJet 4MP, and HP LaserJet 4P models used the least amount of energy by far when idle and when in power-saver mode. The DECLaser 1152 and the Apple LaserWriter Select 310 used the least power while printing.

Using the parallel port, we performed each speed test in HP PCL mode and again in PostScript mode (for those printers that support it).

The **Test Speed** test measures the printer's speed in producing 10 copies of a two-page business letter with 1in margins. A graphics print file was sent directly to the parallel port from DOS.

The **Graphics Speed** test measures the printer's speed in producing two copies of a complex single-page graphic containing a TIFF image, horizontal and vertical grey scales and line art.

The **Word for Windows** test measures the printer's speed in producing a 10-page report that uses multiple fonts and type styles. We tested each printer with the Microsoft Windows driver recommended by the printer's manufacturer.

The **CorelDRAW** test measures the printer's speed in producing a single-page CorelDRAW graphic that contains a TIFF image, horizontal and vertical greyscales, and line art. We tested each printer with the Microsoft Windows driver recommended by the printer's manufacturer.

The **Lotus 1-2-3 for Windows** test measures the printer's speed in producing a complex two-page spreadsheet that contains pie, bar and line charts. We tested each printer with the Microsoft Windows driver recommended by the printer's manufacturer.

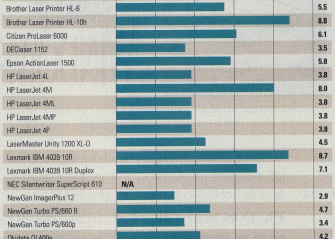
The **Power Consumption** test measures the printer's energy usage under three conditions: when printing, when idle, and when in power-saver mode (sleep mode), where available. For this test only, lower scores indicate better results.

POWER CONSUMPTION

	Power consumption when printing (watts)	Power consumption at rest (watts)	Power consumption in power-saver mode (watts)
Apple LaserWriter Pro 600	151	55	N/A*
Apple LaserWriter Pro 630	188	68	N/A*
Apple LaserWriter Select 310	95	37	N/A*
Brother Laser Printer HL-6	152	63	20
Brother Laser Printer HL-10h	169	36	10
Citizen ProLaser 6000	186	57	N/A*
DECLaser 1152	90	29	N/A*
Epson ActionLaser 1500	192	54	N/A*
HP LaserJet 4L	142	5	4
HP LaserJet 4M	178	71	N/A*
HP LaserJet 4ML	175	6	6
HP LaserJet 4MP	182	9	N/A*
HP LaserJet 4P	181	8	N/A*
LaserMaster Unity 1200 XL-O	176	49	N/A*
Lexmark IBM 4039 10R	242	58	21
Lexmark IBM 4039 10R Duplex	237	49	20
NEC Silentwriter SuperScript 610	162	64	16
NewGen ImagerPlus 12	143	56	N/A*
NewGen Turbo PS/660 B	156	63	N/A*
NewGen Turbo PS/660p	106	38	N/A*
Okidata OL400e	122	42	10
Panasonic KX-P4440	222	66	19
QMS 420 Print System	131	48	N/A*
QMS 860 Print System	219	82	N/A*
Samsung Finale Hi-Res	250	105	N/A*
Star Micronics LS-5EX	116	40	N/A*
TI microLaser Pro 600	143	47	23
TI microWriter	158	55	N/A*

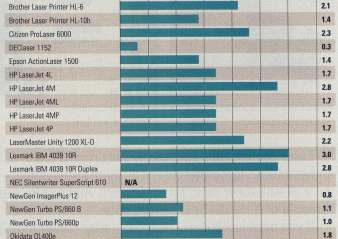
N/A – Not applicable: the product has no power-saver mode*

TEXT SPEED (PCL)

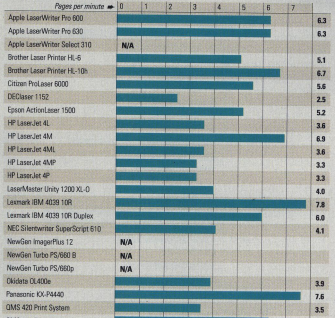


N/A – Not applicable: the printer does not support this emulation

GRAPHICS SPEED (PCL)

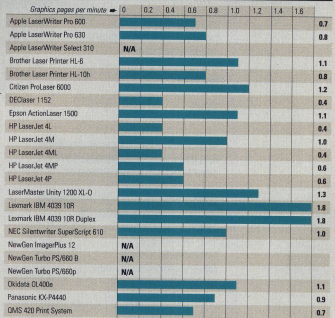


WORD FOR WINDOWS (PCL)

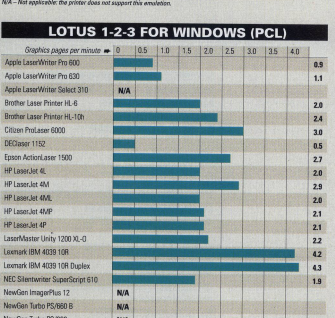


N/A – Not applicable; the printer does not support this emulation.

CORELDRAW (PCL)

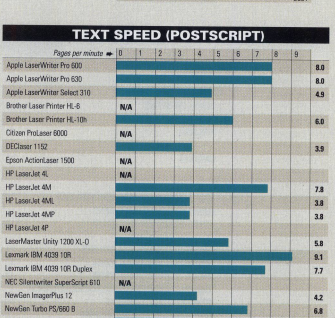


LOTUS 1-2-3 FOR WINDOWS (PCL)



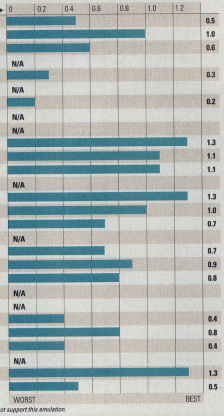
N/A – Not applicable; the printer does not support this emulation.

TEXT SPEED (POSTSCRIPT)



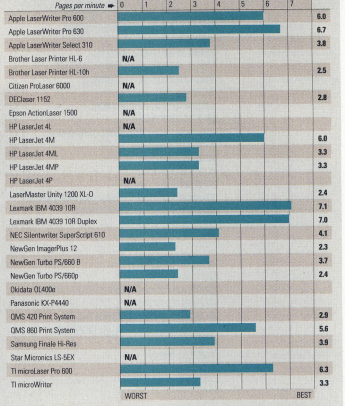
Benchmark tests: mainstream laser printers

GRAPHICS SPEED (POSTSCRIPT)

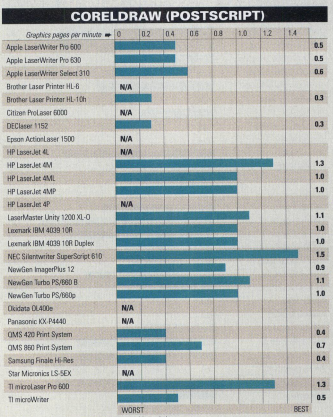


N/A – Not applicable; the printer does not support this emulation.

WORD FOR WINDOWS (POSTSCRIPT)

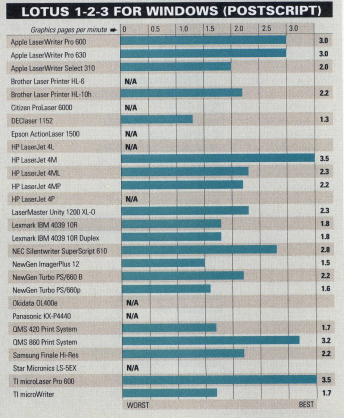


CORELDRAW (POSTSCRIPT)



N/A – Not applicable; the printer does not support this emulation.

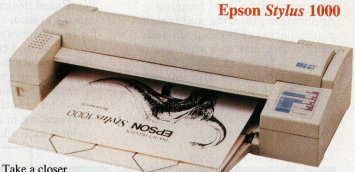
LOTUS 1-2-3 FOR WINDOWS (POSTSCRIPT)



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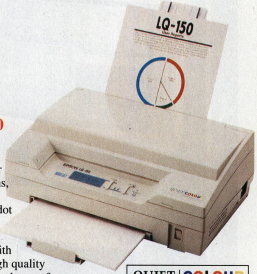
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printed output costs about three to five cents, plus one cent for the cost of the paper itself. By reducing the number of sheets used, duplexing can mean significant savings. Duplexing options are most often found in faster, network-oriented laser printers, but Lexmark's IBM 4039 10R and IBM 4039 10R Duplex, reviewed here, also offer such features.

Another area where printers are being designed to save money is energy conservation. Ten of the 28 printers in this roundup have power-saving modes. In general, these printers use between three and 10 per cent of the electricity in power-saving mode they would use when they are actually printing. Compared with normal idle power consumption, the power-saving modes typically use between a quarter and a third as much power.

Designers have been searching for other ways to create savings for users. Special photoconductor print drums have exceptionally long lifetimes, lowering the per-page cost for consumables. The leaders in this area are the Kyocera Ecosys series printers, which feature drums and photoconductors that are rated for 20 years of use, resulting in a per-page printing cost of 1.52 cents. (Kyocera's new model this year is the 18ppm Kyocera Ecosys Printer FS-3500 reviewed in the Network lasers section next month.)

Hewlett-Packard has taken another approach to lowering consumable costs by putting less toner on the page. The new HP LaserJet 4L, HP LaserJet 4ML, HP LaserJet 4P, and HP LaserJet 4MP have draft modes that print every other dot in each direction, cutting the amount of toner used in half. The output looks grey instead of black but is still completely legible. Some manufacturers have also taught their printers to do more with less. For example, new members of the HP LaserJet 4 family (the 4L, 4P, 4ML, and 4MP) use a memory-enhancement technology that compresses text and images so that most full-page images can fit even in 1M of memory.

Time is of the essence

A printer can save time as well as money and vendors have been seeking ways to do both. This may seem a paradoxical goal for a slow printer, but it actually makes a lot of sense. For example, large graphics files often take a similar length of time to print, no matter what printer you use. The rate-determining factor is not the speed of the engine, but the length of time it takes to transmit the image data from the computer to the printer. To a lesser degree, the speed of the printer's controller also plays a part.

There are many ways manufacturers have tried to cut the time required to print large graphics images. HP's Bi-Tronics high-speed parallel port is one example. PCL 5 and PostScript Level 2 offer significant time savings in that they can compress bitmapped data into smaller data streams than their preceding versions. And RISC processors can significantly speed the time it takes to process complex graphics.

Perhaps the biggest time savers are features that make printers easier to configure and use. Many printers have streamlined user interfaces; some, like the LaserJet 4L, have dumped their control panels almost entirely and rely instead on their intelligence and the software in your computer to handle configuration changes and print job management.

Automatic port switching, available on 25 printers in this roundup (see Summary of features), saves time by letting two users — or more, in some cases — hook their computers directly to a printer without having to worry about front panel controls when sending print jobs. Many printers go a step further to provide simultaneously active ports, which can receive information at the same time, spooling it to memory until it is ready to be processed and printed. Even better is automatic emulation switching, which lets a printer inspect the incoming data stream and decide which printer language (such as PCL or PostScript) it contains.

Review criteria

To make it into this section, a printer had to print at up to 11ppm using laser or LED technology. It also needed to have been introduced since last year's annual Printer issue (December, 1992). As comparison points for this year's crop, we also brought back the HP LaserJet 4M — one of last year's Editor's Choice winners. (And it turns out that a year has done little to diminish its appeal.)

The printers released after testing but before we went to press that deserve mention are the Lexmark IBM 4037 5E, the Fujitsu 4ppm PrintPartner 4000 and the Facit P8045Win, distributed by Nilsen (03) 419 9999. The Lexmark is designed for personal use and will sell for around $1761, the Fujitsu for around $1500, and the direct Windows printer from Facit for around $1800.

From support for 11 by 17in paper to typesetter-quality output, from bargain-basement list prices to comprehensive lists of standard and optional equipment, and from seven-kilo bantams to 25-kilo heavyweights, these 28 mainstream laser printers offer something for everyone — at savings every user will appreciate.

Apple LaserWriter Pro 600

Apple LaserWriter Pro 630

Apple LaserWriter Select 310

By Ted Needleman

Apple Computer's newest LaserWriter models work with PCs much less reluctantly than did the older breed. Two eight-page-per-minute (8ppm), 600-dot-per-inch (600dpi) products, the Apple LaserWriter Pro 600 ($4295) and Apple LaserWriter Pro 630 ($5295), provide HP PCL 4 emulation, in addition to true Adobe PostScript Level 2 support, and offer good connectivity as well.

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HIGHLIGHTS

Mainstream laser printers

UNDER $2000 LASER PRINTERS are the big news this year. Four of the tested products in this roundup have price tags under $2000, with three under $1500. They skimp on memory and lack desirable features such as resolution enhancement, but they are adequate for stand-alone desktop use — especially in text-heavy applications.

THE HP LASERJET 4L sets the pace for basic personal laser printers. With resolution-enhanced 300-dots-per-inch output, four-page-per-minute performance, power-saver and draft-output modes, and other notable features, the LaserJet 4L is priced at $1470. The HP LaserJet 4P ($2199) offers similar capabilities, but it bumps resolution up to 600dpi — all for just over $700.

LOW-COST POSTSCRIPT printers offer Adobe PostScript or various clones for below lower prices. One, the TI microWriter, sells for under $1500. With the advent of TrueType, PostScript is less significant than it used to be for many applications. But if you still need the capability, you can get it for less money than ever before.

600dpi ENGINES are gaining in popularity and coming down in price. sixteen of these reviewed printers offer output at 600dpi or better, but many run at their full resolution only in PostScript, reverting to 300dpi under PCL emulation.

ENVIRONMENTAL considerations play a role in the laser printer's design, largely due to standard set by the US government. Power-saving modes are growing in popularity and are found in 10 of the printers we profile here. Two of HP's models use so little power when resting that they eliminate on/off switches entirely.



LaserWriter Pro 600, LaserWriter Pro 630, LaserWriter Select 310

For the low-cost PostScript market, Apple Computer now sells the 5ppm Apple LaserWriter Select 310 for $1795.

Apple Computer positions the Apple LaserWriter Pro series as workgroup machines, and hooking either model up to a mixed network of PCs and Macs was an easy task. The Apple LaserWriter Pro 600 and Apple LaserWriter Pro 630 are nearly identical: both are based on a 600dpi Canon EX engine and come standard with 8M of RAM (expandable to 32M). Both also include LocalTalk, parallel, and serial ports. The LaserWriter Pro 630 adds an Ethernet port and two SCSI ports for connecting hard disks. With separate software, the printers can autoswitch from one port to another as they become active.

Both LaserWriter Pro models include Apple's PhotoGrade enhanced-greyscale technology, which dramatically improves halftone clarity by providing 61 discrete grey levels. Halftone quality was noticeably better than for most lasers, though not quite of continuous-tone quality.

The Apple LaserWriter Pro models' performance in PostScript mode was strong; under PCL, however, performance fell sharply. In PCL graphics, performance results were among the lowest of the tested printers.

The Apple LaserWriter Select 310 is a PostScript printer with a compelling price. But to reach that point, Apple had to make some concessions. One is speed, particularly when printing graphics: the LaserWriter Select 310 achieved only 0.6gppm (graphics pages per minute) on our Graphics Speed test.

The LaserWriter Select 310 offers a Centronics parallel interface in addition to the LocalTalk interface. Unlike the LaserWriter Pro models, though, the LaserWriter Select 310 does not provide PCL support — nor does it offer PostScript Level 2. During testing, we noted that the text portion of a mixed text and graphics page showed improper kerning.

Apple also provides fewer fonts than usual in a PostScript machine, offering only 13 variations on four typefaces: Courier, Helvetica, Times and Symbol. The printer's 1.5M of RAM is minimal for PostScript duty, but it can be expanded to 5.5M.

If bargain-priced PostScript printing is a priority, the Apple LaserWriter Select 310 is worth considering. For a mixed PC/Macintosh environment where high-quality PostScript output is a priority, the Apple LaserWriter Pro 600 and the Apple LaserWriter Pro 630 are solid choices.

Brother Laser Printer HL-6

Brother Laser Printer HL-10h

By Brad Stilwell

The $1199 Brother Laser Printer HL-6 is a basic 300-dot-per-inch (dpi) personal printer with a faster-than-average six-page-per-minute (ppm) engine. The $2932 Brother Laser Printer HL-10h offers PostScript compatibility, 600dpi resolution with resolution enhancement and a PCMCIA Type I slot. Both printers are thoughtfully designed: they automatically switch emulations and ports and offer audible alarms, making it easy to detect a jam or an empty



Brother Laser Printer HL-6, Brother Laser Printer HL-10h



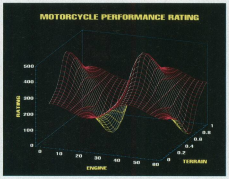
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paper tray. (The alarms can be disabled, however.)

The HL-6 lacks any form of resolution enhancement; it reproduced diagonal lines with visibly jagged edges. But the simplicity of the HL-6's design is a plus. Its Brother engine uses a single-toner cartridge that makes installation easy and ink-free, and it has a built-in 150-page paper tray, 512K of RAM (expandable to 4.5M via a memory board which costs $199 unpopulated), 48 bitmapped fonts, and 12 TrueType fonts standard. The unit we tested, which included 2.5M of RAM, delivered strong performance compared with other printers in the same price range.

The HL-10h is a 600dpi PostScript-compatible printer. With 2M of standard RAM, however, it proved inadequate for complex graphics. Even after adding 4M, our printing in PostScript was agonisingly slow, requiring about four minutes per page on 600dpi graphics. You can expand RAM to 34M using standard SIMMs, but for serious PostScript work, a printer based on a RISC processor instead of the HL-10h's 25MHz Motorola 68030 would likely do better.

Text performance was stronger and text output quality was good. In our graphics tests the HL-10h yielded solid blacks and fine greyscales, and its rules and curves were smoothed by its High Resolution Control. The only conspicuous flaw in its graphics printing was some horizontal and vertical banding.

The HL-10h would serve a small workgroup well. Its MIO slot is compatible with third-party network interfaces for HP LaserJet units; Brother also says it plans to introduce network adaptors in the near future.

Citizen ProLaser 6000

By Ted Needleman

Built around a six-page-per-minute (6ppm) Minolta engine, the $1999 Citizen ProLaser 6000 ably meets the needs of the entry-level laser printer market. PCL 5-compatible and standard with 1M of RAM, it expands to 5M using standard SIMMs. It also comes with CG Times and Univers (both scalable), Prestige Elite, and the more common Courier and Line Printer typefaces.

Under the front panel is an internal paper tray holding 150 letter or legal-size sheets. The 300-dot-per-inch (300dpi) ProLaser 6000 uses a microfine toner and a resolution-enhancement scheme, Fine ART (Advanced Resolution Technology), to create crisp, dark type and graphics: only slight banding showed on graphics output and distortion was minimal at low type sizes. Citizen claims you get 6000 pages from its combined toner/developer/drum cartridge. Based on an AMD Am29200 RISC processor, the ProLaser had impressive speed test results, actually beating its rated speed slightly in our Text Speed test. Graphics speed was also respectable at 2.3gppm.



Citizen ProLaser 6000

DEClaser 1152

By Ted Needleman

Based on a four-page-per-minute (4ppm) Canon LX engine, Digital Equipment Corp's DEClaser 1152 seems to have it all: a $2051 price tag, Adobe PostScript Level 2 (with 17 fonts) and HP PCL 4 and legendary Digital quality. But with its bottom-of-the-pack graphics performance, this printer is best suited to light-duty personal use.

The DEClaser 1152's graphics speed in PostScript mode was one of the slowest of the laser printers we tested, requiring about four minutes per page of complex graphics. Text speed was good for a 4ppm printer at 3.5ppm in PCL mode and 3.9ppm in PostScript. The 300-dot-per-inch resolution of the DEClaser 1152 can be enhanced through Digital's proprietary DECimage technology which comes as a software utility. The company claims the DEClaser's enhanced output is equivalent to 1000dpi printing; we found that text was produced cleanly and the graphics had good contrast ratios. The DEClaser 1152 printer has three interfaces: serial, parallel, and LocalTalk.



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The DEClaser 1152 can sense which of the ports is active at any given time and switch among them as necessary.

It does not, however, automatically switch between PostScript and PCL 4 printing modes.

The standard fold-down Canon LX engine front-panel paper tray holds only 70 sheets of letter or legal-size paper, but an 246 250-sheet-capacity, bottom-mounting sheet feeder is available as an option.

Epson EPL-5200

By Ted Needleman

The EPL-5200 from Epson is based on a Minolta six-page-per-minute (6ppm) laser engine and powered by a 16MHz Motorola 68000 CPU.

With a price tage of $1555, the EPL-5200 comes with 1M of RAM and takes DRAM chips to expand the RAM up to 5M. It features PCL 5 and includes 13 scalable internal fonts and Courier 10 and 12-point and EDP 8.5-point line printer fonts.

The unit can take an $893 PostScript card when 1.5M or more of RAM is installed. Operation is easy: once you set the SelecType front panel to recognise the PostScript option, the printer goes from PCL to PostScript automatically. Setting up the printer was easy as well, and delivered close to the rated 6ppm output speed. Graphics printed at 1.4ppm, about average for a printer in this class. Epson includes its own version of resolution enhancement, called RITech, with the EPL-5200. Output quality was crisp and dark with some minor banding showing in our graphics samples.

The EPL-5200 has a 150-sheet paper input trays. Epson also offers an optional 250-sheet cassette ($340), plus AppleTalk and Ethernet network interface cards.

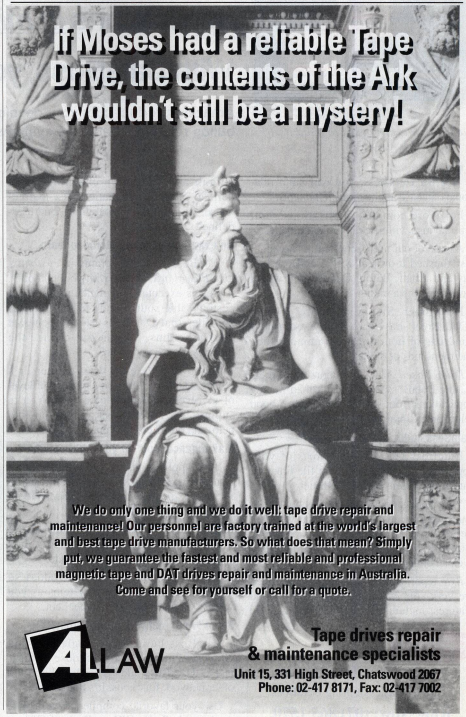
HP LaserJet 4L
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HP LaserJet 4ML
HP LaserJet 4MP
HP LaserJet 4P

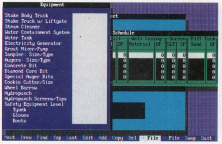
By Edward Mendelson

True to Hewlett-Packard tradition, the company's two new pairs of four-page-per-minute (4ppm) laser printers offer superior design and features at affordable prices. The 300-dot-per-inch (300dpi) HP LaserJet 4L, with its price tag of $1470, has established the lead for other low-cost contenders to follow. The HP LaserJet 4P, which lists for $2199, is one of the least expensive 600dpi printers you'll find. Similar models of these printers are available with a true Adobe PostScript Level 2 interpreter. With that feature, they're called the HP LaserJet 4ML ($2200) and HP LaserJet 4MP ($2719). Again this year we tested the HP LaserJet 4M, now $4456, which won an Editors' Choice award last year for providing 8ppm performance and 600dpi quality on top of true Adobe PostScript Level 2 support.

The four new HP printers garnered the best results by far on our Power Consumption test. And power isn't all these printers conserve: their optional draft mode prints passable output using half the normal amount of toner.

The new models also incorporate some of the features of Microsoft's Windows Printing System (a plug-in cartridge for the HP LaserJet II and 3 series). These include, most notably, improved two-way communication that results in enhanced status reports. And all provide HP's Memory Enhancement technology, a compression





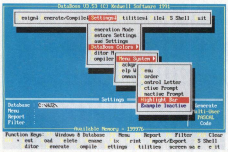
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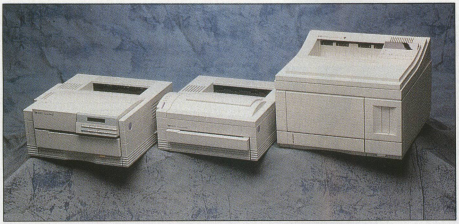
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HP LaserJet 4P, HP LaserJet 4L, HP LaserJet 4M

technique that the company says effectively doubles memory. HP's Resolution Enhancement Technology is supported as well, so output is free of significant jaggies. Output from the 600dpi models is especially impressive.

The LaserJet 4L and LaserJet 4ML are 300dpi personal printers based on the Canon PX engine. Both have a single bin that holds 100 sheets of paper; neither unit accepts font cartridges.

The LaserJet 4L comes with 1M of RAM (expandable to 2M) and 26 Intellifonts. Text speed was typical for 4ppm printers, and PCL graphics performance was strong. The LaserJet 4ML is a similar model that comes with Adobe PostScript Level 2 support and 4M of RAM. It also includes 35 Intellifonts, 10 TrueType fonts, and 35 Type 1 fonts.

The LaserJet 4P and LaserJet 4MP are based on a 600dpi Canon PXII engine. Both hold 250 sheets and provide a straight-through paper path for thick paper and envelopes. Text and graphics printing speed results for both were good. Unlike many other 600dpi printers here, the LaserJet 4P and LaserJet 4MP print at their full resolution even under PCL.

The LaserJet 4P comes with 2M of RAM (expandable to 26M) and includes 35 Intellifonts and 10 TrueType fonts. It also accepts PCL font cartridges. You can add PostScript Level 2 support with a $626 SIMM. The LaserJet 4MP includes an Adobe PostScript Level 2 interpreter and 6M of RAM (expandable to 22M).

Last year, the LaserJet 4M set the standard for high-quality output, solid performance and effortless operation. Its features haven't changed: they include 6M of RAM (expandable to 32M), two paper trays, 35 Intellifonts, 10 TrueType fonts, and 35 Type 1 fonts. A LocalTalk port is standard, so it should be easy to connect the LaserJet 4M to Macintosh networks (thus the M suffix).

The LaserJet 4M has an 8ppm, 600dpi Canon EX engine and a 20MHz Intel 80960KA RISC processor. The printer turned in very high scores on our text and graphics tests. It comes with 35 Intellifonts, 10 TrueType fonts, and 35 Type 1 fonts as well as 6M of RAM (expandable to 32M).

The HP LaserJet 4 line offers some of the most impressive technology you'll find — at standard-setting prices.

IBM 4039 10R

IBM 4039 10R Duplex

By Hal Glatzer

The 10-page-per-minute (10ppm), 600-dot-per-inch (600dpi) IBM 4039 10R and IBM 4039 10R Duplex are worthy successors to the IBM LaserPrinter 10P, an Editors' Choice



IBM 4039 10R, IBM 4039 10R Duplex

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Apple LaserWriter Pro 600

8-ppm laser printer (Canon EX engine) with 600-dpi output, Adobe PostScript Level 2, HP PCL 4

PCL Text Speed: 3.5 ppm
PCL Graphics Speed: 0.9 ppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 6.3 ppm
CorelDRAW: 0.7 ppm
Lotus 1-2-3 for Windows: 0.9 ppm

PS Text Speed: 8.0 ppm
PS Graphics Speed: 0.5 ppm
PS WINDOWS APPLICATIONS:
Word for Windows: 6.0 ppm
CorelDRAW: 0.5 ppm
Lotus 1-2-3 for Windows: 3.0 gppm





Apple LaserWriter Pro 630

8-ppm laser printer (Canon EX engine) with 600-dpi output, Adobe PostScript Level 2, HP PCL 4

PCL Text Speed: 7.4 ppm
PCL Graphics Speed: 0.8 ppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 6.3 ppm
CorelDRAW: 0.8 ppm
Lotus 1-2-3 for Windows: 1.1 gppm

PS Text Speed: 8.0 ppm
PS Graphics Speed: 1.0 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 6.7 ppm
CorelDRAW: 0.9 gppm
Lotus 1-2-3 for Windows: 3.0 gppm





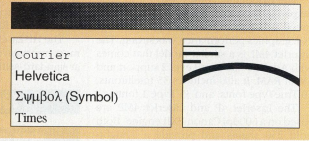
Apple LaserWriter Select 310

5-ppm laser printer (Fuji Xerox engine) with 300-dpi output, Adobe PostScript

PS Text Speed: 4.9 ppm
PS Graphics Speed: 0.6 gppm

PS WINDOWS APPLICATIONS:
Word for Windows: 3.8 ppm
CorelDRAW: 0.6 gppm
Lotus 1-2-3 for Windows: 2.0 gppm





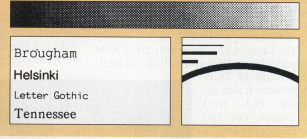
Brother Laser Printer HL-6

6-ppm laser printer (Brother HL-6 engine) with 300-dpi output, HP PCL 4

PCL Text Speed: 5.5 ppm
PCL Graphics Speed: 2.1 gppm

PCL WINDOWS APPLICATIONS:
Word for Windows: 5.1 ppm
CorelDRAW: 1.1 gppm
Lotus 1-2-3 for Windows: 2.0 gppm





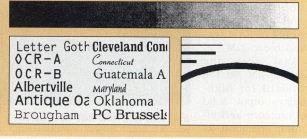
Brother Laser Printer HL-10h

10-ppm laser printer (Brother HL-10h engine) with 600-dpi output, BR-Script, enhanced HP PCL 5

PCL Text Speed: 8.8 ppm
PCL Graphics Speed: 1.4 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 6.7 ppm
CorelDRAW: 0.8 gppm
Lotus 1-2-3 for Windows: 2.4 gppm

PS Text Speed: 8.0 ppm
PS Graphics Speed: 0.3 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 2.5 ppm
CorelDRAW: 0.3 gppm
Lotus 1-2-3 for Windows: 2.2 gppm





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AT I/O Card 2 Serial, 1 Parallel, 1 Game,
IDE Controller, 101 Key Keyboard
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1.2 And 1.44 Floppy Disk Drive
212 Mb Maxtor Enhanced Hard Disk
1 Mb VLB Windows Accel Super Vga Card
KTX 15" Digital Non LOW RADIATION (1280 x 1024) .28
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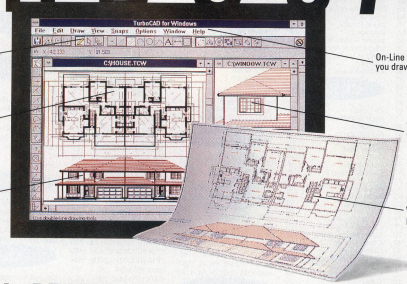
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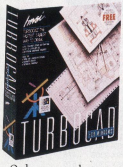
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Ad number ATWIN10

recipient last year. The IBM 4039 10R, which supports PCL 5 and Lexmark's own PostScript emulator, costs $4166; the Duplex model sells for $5242, making it one of the least expensive two-sided laser printers around. It also has one of the easiest-to-use control panels you'll find.

The IBM 4039 10R scored an impressive 9.1ppm under PostScript emulation and 8.7ppm under PCL 5 on our Text Speed test. Graphics speed was good under PCL 5 emulation but lagged in PostScript mode.

The IBM printers produce 600dpi output only under PostScript emulation. Though 300dpi graphics were grainy and unimpressive, 600dpi graphics were crisp.

The IBM 4039 10R Duplex can be purchased ready to run out of the box or you can upgrade the standard IBM 4039 10R yourself with a $1266 Duplex kit. Installing the kit is easy, although we initially encountered an insufficient-memory error that the manual didn't clearly explain how to resolve. Performance in duplex mode was 6.3ppm, the result of overhead while the duplexer flips the paper. Though the IBM 4039 10R itself is quiet, we found that the duplexing unit isn't so well muffled.

Whether you need two-sided output now or think you might sometime in the future, these models offer low-cost, high-speed solutions.

LaserMaster LMU 1200XLO

By Joseph Desposito

The LaserMaster LMU 1200XLO Plain-Paper Typesetter ($21,934) offers exceptional-quality 1200 by 1200 dot-per-inch (dpi) resolution. It includes 235 Type 1 typefaces, and you can print on sheets of up to 12 by 19.5in or tabloid-size pages (11 by 17in) with full bleeds and registration and crop marks.

The unit's 600dpi Toshiba A-655 engine uses a separate drum and two-stage toner process. The engine doesn't deliver 1200dpi directly but relies on LaserMaster's proprietary TurboRes resolution-enhancement and TurboGray halftone-enhancement technologies to generate an effective 1200 by 1200dpi resolution in text and graphics. TurboGray improves halftone images by providing increased grey levels at high screen frequencies. Text printed at 1200dpi was crisp and dark during testing, and halftones were of near-photographic quality.

The LMU 1200XLO is powered by a 33MHz, 32-bit proprietary RISC processor. Page description languages are LaserMaster Enhanced TrueImage (which is PostScript compatible) and HP PCL 4. The unit automatically senses emulations and does automatic port switching among built-in LocalTalk, parallel, serial, and Ethernet ports. An 80M hard disk and 32M of RAM are standard.



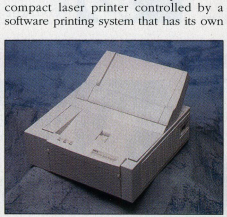
The LaserMaster LMU 1200XLO Plain-Paper Typesetter

Paper up to 11 by 17in fits into a cassette under the printer. Different sizes require you to place different plastic 'keys' into the cassette. A rear-mounted multipurpose feeder lets you print tabloid-size full bleeds on oversize paper. The 8ppm printer mustered less than 6ppm on our Text Speed test in PostScript mode and fared even worse in PCL 4 mode. But its scores on our Graphics Speed test were good. Those seeking alternatives to more costly traditional typesetters should consider this unit.

NEC Silentwriter SuperScript 610

By Greg Pastrick

The just-released NEC Silentwriter SuperScript 610 is a GDI (Graphics Device Interface) printer that NEC estimates will sell on the street for around $1500 (set prices were not available as we went to press). GDI printers convert Microsoft Windows' native graphics format directly into bitmaps, usually by using a software rasteriser on the host PC. This helps reduce hardware costs but also means that you can only print from within Windows. The SuperScript 610 is a compact laser printer controlled by a software printing system that has its own



The NEC Silentwriter SuperScript 610

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QMS® 1725 Print System	17 pages per minute	300x300 dpi or 600x600 dpi	RS232 Serial, AppleTalk®, Parallel, Ethernet TCP/IP, DECnet®, Novell®	Dual	A4 Paper, Labels, Transparency
QMS® 2025 Print System	20 pages per minute	400x400 dpi	RS232 Serial, AppleTalk®, Parallel, Ethernet TCP/IP, DECnet®, TokenRing®	Triple	A4/A3 Paper, Labels, Transparency
QMS® 3225 Print System	32 pages per minute	400x400 dpi	RS232 Serial, AppleTalk®, Parallel, Ethernet TCP/IP, DECnet®, TokenRing®	Triple	A4/A3 Paper, Labels, Transparency
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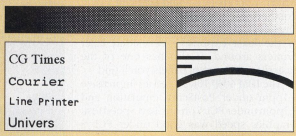
Citizen ProLaser 6000

6-ppm laser printer (Minolta engine) with 300-dpi output, HP PCL 5



PCL Text Speed: 6.1 ppm
PCL Graphics Speed: 2.3 gppm

PCL WINDOWS APPLICATIONS:
Word for Windows: 5.6 ppm
CorelDRAW: 1.2 gppm
Lotus 1-2-3 for Windows: 3.0 gppm



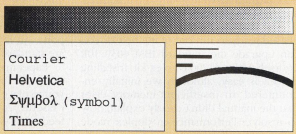
DEClaser 1152

4-ppm laser printer (Canon LX engine) with 300-dpi output, Adobe PostScript Level 2, HP PCL 4



PCL Text Speed: 3.5 ppm
PCL Graphics Speed: 0.3 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 2.5 ppm
CorelDRAW: 0.4 gppm
Lotus 1-2-3 for Windows: 0.5 gppm

PS Text Speed: 3.9 ppm
PS Graphics Speed: 0.2 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 2.8 ppm
CorelDRAW: 0.3 gppm
Lotus 1-2-3 for Windows: 1.3 gppm



Epson ActionLaser 1500

6-ppm laser printer (Minolta SP-6CL engine) with 300-dpi output, HP PCL 5; Adobe PostScript interpreter, $449



PCL Text Speed: 5.8 ppm
PCL Graphics Speed: 1.4 gppm

PCL WINDOWS APPLICATIONS:
Word for Windows: 5.2 ppm
CorelDRAW: 1.1 gppm
Lotus 1-2-3 for Windows: 2.7 gppm



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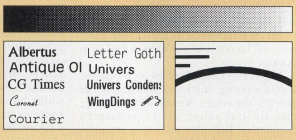
HP LaserJet 4L

4-ppm laser printer (Canon PX engine) with 300-dpi output, enhanced HP PCL 5



PCL Text Speed: 3.8 ppm
PCL Graphics Speed: 1.7 gppm

PCL WINDOWS APPLICATIONS:
Word for Windows: 3.6 ppm
CorelDRAW: 0.4 gppm
Lotus 1-2-3 for Windows: 2.0 gppm



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HP LaserJet 4M

8-ppm laser printer (Canon EX engine) with 600-dpi output, Adobe PostScript Level 2, enhanced HP PCL 5

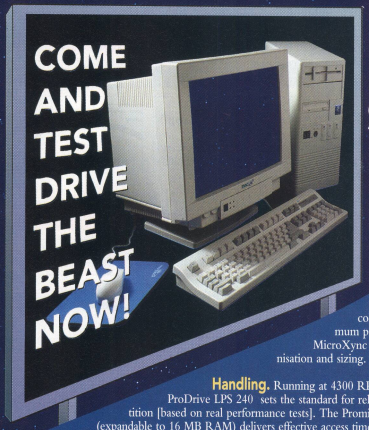


PCL Text Speed: 8.0 ppm
PCL Graphics Speed: 2.8 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 6.9 ppm
CorelDRAW: 1.0 gppm
Lotus 1-2-3 for Windows: 2.9 gppm

PS Text Speed: 7.8 ppm
PS Graphics Speed: 1.3 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 6.0 ppm
CorelDRAW: 1.3 gppm
Lotus 1-2-3 for Windows: 3.5 gppm



ZONDATA THE NEED FOR SPEED



$4,990 inc tax.

THE SUPERCHARGED BEAST

For those who have the need for speed, Zondata have created a monster.

Performance. 80486DX2-66 , one of the fastest CPU on the market, complemented with the 256KB on board SRAM Cache, and the 3 VESA local bus slots will deliver all the grunt you'll ever need for those complex calculations and graphics applications. The beast is powered with 8 MB RAM (expandable to 32 MB) However, at Zondata warp speed is not enough.

Acceleration. The 2 MB VRAM VESA Local bus Diamond Viper, with the reputation as the fastest VLB Graphics Accelerator, takes full advantage of the 32-bit VESA Local Bus architecture. This ensures superfast performance capable of displaying over 16 million colours for photo realistic images.

View. Awarded as the No 1 monitor in Australian PC World Oct. 1993 the MAG MX 15F Flat Screen Monitor offers maximum colours, maximum resolution (1280 x 1024 non-interlaced), and maximum performance with minimum radiation (MPRII awarded). The MicroXync ™ Technology offers intelligent mode switching for optimal synchronisation and sizing. Vertical refresh up to 120 Hz ensures less eye strain.

Handling. Running at 4300 RPM with a 3.8 MB/sec transfer rate and 256 KB cache, the Quantum ProDrive LPS 240 sets the standard for reliability and performance at a rate 30-40 per cent faster than the competition [based on real performance tests]. The Promise DC4030 VLB caching controller complete with 512 KB RAM (expandable to 16 MB RAM) delivers effective access time in less than 0.3 milliseconds. The system is enhanced with a 1.44MB or 1.2MB High Density Panasonic floppy drive and MS-DOS 6.0

Comfort. Warp speed operation can be painful without comfort. Zondata have considered the user right down to the fingertips with the crisp design of the Honeywell 101 keyboard and ergonomic Microsoft mouse.

Multimedia Kit

Sony CDU-31A CD ROM drive • Sound Blaster Pro Basic sound board with utilities • Built in I/O controller with cable • Six leading multimedia reference, game and graphics CD titles • MPC compatible, meets 100% MPC requirements • Supports XA and CD-I discs. • Audio cable and user manual • All installation software

$699 inc tax.

Notebook Pearl 486/NT

• 486SX-25 • VGA Mono • VESA Local BUS (VGA & IDE) • 4MB DRAM on board (Expandable up to 8MB/20MB) • Built in 2.5" 120MB HDD (240MB Optional) • Built in 3.5" 1.44MB FDD • Local Bus VGA with 512K Video RAM • Supports LCD and External Monitor Dual Display • PCMCIA Type 1,2,3 • Built in trackball

$3,050 inc tax.

486DX-33 MHz VLB

486DX-33 Intel CPU 256 Kb Cache • 2 VESA Local Bus • 4 Mb RAM (70 ns Japanese Brand) • 130 MB HDD • 1.44Mb (3 1/2" Panasonic FDD • IDE VLB Host adapter 2 serial 1 parallel • 1 MEG Cirrus logic VLB Windows accelerator card • 14" Non-interlaced monitor • Slim line case - 200 Watt powers supply • Chicony 101 Keyboard • Microsoft OEM Mouse • Microsoft DOS 6.0 & Microsoft Windows 3.1 (licensed version)

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HP LaserJet 4ML

4-ppm laser printer (Canon PX engine) with 300-dpi output, Adobe PostScript Level 2, enhanced HP PCL 5



PCL Text Speed: 3.8 ppm
PCL Graphics Speed: 1.7 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 3.6 ppm
CorelDRAW: 0.4 gppm
Lotus 1-2-3 for Windows: 2.0 gppm

PS Text Speed: 3.8 ppm
PS Graphics Speed: 1.1 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 3.3 ppm
CorelDRAW: 1.0 gppm
Lotus 1-2-3 for Windows: 2.3 gppm



HP LaserJet 4MP

4-ppm laser printer (Canon PXII engine) with 600-dpi output, Adobe PostScript Level 2, enhanced HP PCL 5



PCL Text Speed: 3.8 ppm
PCL Graphics Speed: 1.7 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 3.3 ppm
CorelDRAW: 0.6 gppm
Lotus 1-2-3 for Windows: 2.1 gppm

PS Text Speed: 3.8 ppm
PS Graphics Speed: 1.1 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 3.3 ppm
CorelDRAW: 1.0 gppm
Lotus 1-2-3 for Windows: 2.2 gppm



APC MAGAZINE EDITORS CHOICE

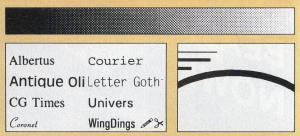
HP LaserJet 4P

4-ppm laser printer (Canon PXII engine) with 600-dpi output, enhanced HP PCL 5; Adobe PostScript Level 2 interpreter, $499



PCL Text Speed: 3.8 ppm
PCL Graphics Speed: 1.7 gppm

PCL WINDOWS APPLICATIONS:
Word for Windows: 3.3 ppm
CorelDRAW: 0.6 gppm
Lotus 1-2-3 for Windows: 2.1 gppm



LaserMaster Unity 1200XL-O Plain-Paper Typesetter

8-ppm laser printer (Toshiba A-655 engine) with 1,200-dpi output, LaserMaster PostScript, HP PCL 4



PCL Text Speed: 4.5 ppm
PCL Graphics Speed: 2.2 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 4.0 ppm
CorelDRAW: 1.3 gppm
Lotus 1-2-3 for Windows: 2.2 gppm

PS Text Speed: 5.9 ppm
PS Graphics Speed: 1.3 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 2.4 ppm
CorelDRAW: 1.1 gppm
Lotus 1-2-3 for Windows: 2.3 gppm



Lexmark IBM 4039 10R

10-ppm laser printer (Lexmark 4039 engine) with 600-dpi output, Lexmark PostScript, HP PCL 5



PCL Text Speed: 8.7 ppm
PCL Graphics Speed: 3.0 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 7.8 ppm
CorelDRAW: 1.8 gppm
Lotus 1-2-3 for Windows: 4.2 gppm

PS Text Speed: 9.1 ppm
PS Graphics Speed: 1.0 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 7.1 ppm
CorelDRAW: 1.0 gppm
Lotus 1-2-3 for Windows: 1.8 gppm



The most versatile Barcode Reader in the world...



To build a better barcode reader, ask the users. So we did.

Many applications required barcode scanning directly into a computer most of the time, but portable battery powered scanning some of the time (perhaps for stocktakes or to collect data away from the computer). People either had to purchase two barcode readers, a fixed one plus an expensive portable reader, or they just neglected stocktakes and other valuable uses for their barcode readers. Even those who bought expensive portable readers found the units spent a lot of time gathering dust on a shelf somewhere, discharging their batteries, which meant they weren't ready when they were needed. Infrequently used, people forgot how they worked.

ASP's answer was to design a Portable Barcode Reader that was able to function as an ordinary fixed barcode reader AND a battery powered portable barcode reader with large memory. All in the one versatile unit.

Simple to use, its Home Base incorporates both RS 232 and PC Keyboard emulation interfaces, and automatic recharging for the Portable. The simple and rugged keyboard is easy to understand, and no special programming is required (but is available at low cost if you ever need it). The angled display is clear and easy to read, and has been designed for both hand-held and desktop use. Security memory back-up ensures your data is kept for up to 10 years, even with the reader turned off. And finally, we priced the ASP Portable at about half what you'd pay for many of its less versatile competitors.

Did we get it right? Well, ASP has been building its innovative Portable for over two years, and they keep going out the door as fast as we can build them!

We keep improving the product and adding new models such as our POWER PORTABLE with larger memory and on board programming language; but we never forget our existing customers. Older ASP Portables can be upgraded at low cost to many of our latest specifications.

The ASP Portable Barcode Reader comes with a quality wand or CCD scanner and like all ASP's products is covered by one year warranty.

So buy our Portable Barcode Reader because it's Australian, but also buy it because it's the MOST VERSATILE Barcode Reader available!

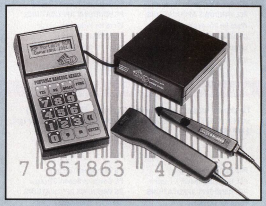
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ASP's Australian designed and manufactured Portable Barcode Reader comes with Home Base and WAND/2000 (or optional CCD Scanner). The high reliability ASP WAND/2000 uses a synthetic sapphire tip, and a strong yet flexible 1.5m cable. The ASP CCD Scanner is a rugged single touch Auto Scanner ideal for point of sale applications and reading barcodes on curved or uneven surfaces.



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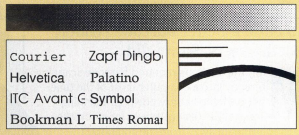
Lexmark IBM 4039 10R

10-ppm laser printer (Lexmark 4039 engine) with 600-dpi output, Lexmark PostScript, HP PCL 5



PCL Text Speed: 8.7 ppm
PCL Graphics Speed: 3.0 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 7.8 ppm
CorelDRAW: 1.5 gppm
Lotus 1-2-3 for Windows: 4.2 gppm

PS Text Speed: 9.1 ppm
PS Graphics Speed: 1.0 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 7.1 ppm
CorelDRAW: 1.0 gppm
Lotus 1-2-3 for Windows: 1.8 gppm



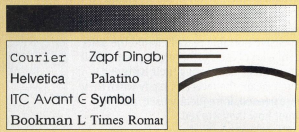
Lexmark IBM 4039 10R Duplex

10-ppm laser printer (Lexmark 4039 engine) with 600-dpi output, Lexmark PostScript, HP PCL 5



PCL Text Speed: 7.1 ppm
PCL Graphics Speed: 2.8 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 6.0 ppm
CorelDRAW: 1.8 gppm
Lotus 1-2-3 for Windows: 4.3 gppm

PS Text Speed: 7.7 ppm
PS Graphics Speed: 0.7 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 7.0 ppm
CorelDRAW: 1.0 gppm
Lotus 1-2-3 for Windows: 1.8 gppm



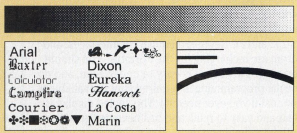
NEC Silentwriter SuperScript 610

6-ppm laser printer (NEC LCR50 engine) with 300-dpi output, HP PCL 4; NEC's SuperScript PostScript interpreter, $99



PCL Text Speed: N/A
PCL Graphics Speed: N/A
PCL WINDOWS APPLICATIONS:
Word for Windows: 4.1 ppm
CorelDRAW: 1 gppm
Lotus 1-2-3 for Windows: 1.9 gppm

PS Text Speed: N/A
PS Graphics Speed: N/A
PS WINDOWS APPLICATIONS:
Word for Windows: 4.1 ppm
CorelDRAW: 1.5 gppm
Lotus 1-2-3 for Windows: 2.8 gppm



N/A—Not applicable. This Windows GDI (Graphics Device Interface) printer could not complete our DOS-based tests.

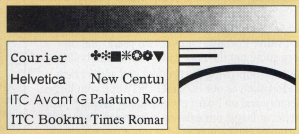
NewGen ImagerPlus 12

8-ppm laser printer (Toshiba TN-7270 engine) with 1,200-dpi output, NewGen PostScript, HP PCL 4



PCL Text Speed: 2.9 ppm
PCL Graphics Speed: 0.8 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: N/A
CorelDRAW: N/A
Lotus 1-2-3 for Windows: N/A

PS Text Speed: 4.2 ppm
PS Graphics Speed: 0.7 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 2.3 ppm
CorelDRAW: 0.9 gppm
Lotus 1-2-3 for Windows: 1.5 gppm



N/A—Not applicable. The printer was not fully compatible with this test.

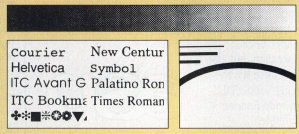
NewGen Turbo PS/660 B

8-ppm laser printer (Canon BX engine) with 600-dpi output, NewGen PostScript, HP PCL 4



PCL Text Speed: 4.7 ppm
PCL Graphics Speed: 1.1 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: N/A
CorelDRAW: N/A
Lotus 1-2-3 for Windows: N/A

PS Text Speed: 6.8 ppm
PS Graphics Speed: 0.9 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 3.7 ppm
CorelDRAW: 1.1 gppm
Lotus 1-2-3 for Windows: 2.2 gppm



N/A—Not applicable. The printer was not fully compatible with this test.

AUVA

AUVA MEDIA PC (AUVA 480/33)

- CPU: i80486™DX-33 microprocessor
- MAINBOARD: VESA BUS upgradeablt to P24T CPU.
- MEMORY: 4MB on board expandable to 32 MB
- I/Q ADAPTOR: VESA 32 -bit IDE with 2S/1P/1G
- VIDEO ADAPTOR: VESA 32-bit 1MB SVGA with Windows Accelerator & high Colours.
- HDD: 200MB
- FDD: 3.5" 1.44MB x 1; 5.25" 1.2MB x 1
- AMP: Build in 10W x 2
- SPEAKER: Build in 8W x 2
- CASE: For MPC only
- CD-ROM DRIVER: Philip CM205 CDU
- SOUND CARD: Sound Blaster pro.



Multimedia

AUVAMEDIA

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- OFFICE PRESENTATION
- GOVERNMENT DATA STORAGE
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- HOME ENTERTAINMENT
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Castle Hill 2154 NSW A.C.N. 050 060 841
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Summary of features: Laser printers

● — YES ○ — NO Products listed in alphabetical order	Apple LaserWriter Pro 600	Apple LaserWriter Pro 630	Apple LaserWriter Select 310	Brother Laser Printer HL-6	Brother Laser Printer HL-10h	Citizen ProLaser 6000
List price	$4295	$5295	$1795	$1199	$2932	$1999
Distributor	Apple Computer	Apple Computer	Apple Computer	Brother Industries	Brother Industries	PanCorp
Telephone	(02) 452 8000	(02) 452 8000	(02) 452 8000	(02) 887 4344	(02) 887 4344	(03) 696 3539
Physical characteristics						
Dimensions (HWD in cms)	30.7 by 42.7 by 42.9	30.7 by 42.7 by 42.9	20.3 by 38.1 by 46.5	31 by 43.4 by 63.5	27.7 by 40.1 by 37	22.6 by 35.8 by 45.5
Weight	17.7kg	17.7kg	11.8kg	13.6kg	16.8kg	10kg
Engine type	Laser	Laser	Laser	Laser	Laser	Laser
Engine model	Canon EX	Canon EX	Fuji Xerox	Brother HL-6	Brother HL-10h	Minolta
Maximum resolution in HP PCL (dpi)	300 by 300	300 by 300	N/A*	300 by 300	600 by 600	300 by 300
Maximum resolution in PostScript (dpi)	600 by 600	600 by 600	300 by 300	300 by 300	600 by 600	N/A**
RISC processor	N/A**	N/A**	16MHz AMD Am29205	N/A**	N/A**	13MHz AMD Am29200
Rated engine speed (pages per minute)	8	8	5	6	10	6
Single-cartridgetoner/developer/drum	●	●	●	●	●	●
Toner capacity (images)	4000	6000	4000	3500	4000	6000
Standard/maximum RAM	8M/32M	8M/32M	1.5M/5.5M	512K/4.5M	2M/32M	1M/5M
Accepts standard SIMMs	●	●	●	●	●	○
Interfaces						
Parallel/serial port	●●	●●	●○	●●	●●	●●
LocalTalk port	●	●	●	○	Optional	○
SCSI port for hard disk	○	●	○	○	●	○
Ethernet	○	●	○	○	Optional	○
Token Ring	○	○	○	○	Optional	○
Automatic interface switching	●	●	●	●	●	●
Simultaneously active ports	●	●	●	●	●	●
Paper handling						
Capacity of each standard input cassette (sheets)	250, 100	250, 100	250	150	250	150
Capacity of each standard output tray (sheets)	250	250	250	50	250	100
Can print on A3-size paper	○	○	○	○	○	○
Duplexing	○	○	○	○	○	○
Rated maximum paper weight	12.7kg	12.7kg	12.7kg	12.7kg	16.3kg	10.9kg
Fonts and features						
HP PCL support	PCL 4	PCL 4	None	PCL 4	PCL 5e	PCL 5
Accepts HP-compatible font cartridges	○	○	○	●	●	●
PostScript language support	Adobe PostScript Level 2	Adobe PostScript Level 2	Adobe PostScript	None	BR-Script	None
Number of Type 1 fonts provided	35	35	17	N/A**	35	N/A**
Automatic emulation switching	●	●	○	●	●	●
Resolution enhancement	●	●	○	○	●	●
Printer-specific Windows 3.1 driver available	● (included)	● (included)	● (included)	● (included)	● (included)	● (via BBS)
Customer support						
Warranty	One year	One year	One year	One year	One year	Two years

N/A* — Not applicable: the product does not have this feature. N/A** — Not applicable: this unit is not a PostScript printer.

DEClaser 1152	Epson EPL-5200	HP LaserJet 4L	HP LaserJet 4M	HP LaserJet 4ML	HP LaserJet 4MP	HP LaserJet 4P	LaserMaster LMU 1200XL
$2051	$1555	$1470	$4456	$2200	$2719	$2199	$21934
Digital Equipment	Epson	Hewlett-Packard	Hewlett-Packard	Hewlett-Packard	Hewlett-Packard	Hewlett-Packard	Mitsui
008 021 246	(02) 452 0666	131 347	131 347	131 347	131 347	131 347	(02) 452 0452
20.3 by 35 by 40.4	22.6 by 36.8 by 45.7	16.5 by 36.8 by 35.6	29.7 by 41.8 by 40.4	16.5 by 36.8 by 35.6	17.3 by 37.3 by 39.1	17.3 by 37.3 by 39.1	20.8 by 48.5 by 70.1
11.3kg	10kg	7.2kg	16.8kg	7.2kg	9kg	9kg	24.4kg
Laser	Laser	Laser	Laser	Laser	Laser	Laser	Laser
Canon LX	Minolta SP-6CL	Canon PX	Canon EX	Canon PX	Canon PXII	Canon PXII	Toshiba A-655
300 by 300	300 by 300	300 by 300	600 by 600	300 by 300	600 by 600	600 by 600	600 by 600
300 by 300	300 by 300	N/A	600 by 600	300 by 300	600 by 600	600 by 600	1200 by 1200
N/A**	N/A**	N/A**	20MHz Intel 80960KA	20MHz Intel 80960KA	20MHz Intel 80960KA	16MHz Intel 80960SA	33MHz proprietary CPU
4	6	4	8	4	4	4	8
●	●	●	●	●	●	●	○
3300	6000	3000	8000	3000	3000	3000	5000
2M/4M	1M/5M	1M/2M	6M/32M	4M/4M	6M/22M	2M/26M	32M/48M
○	○	○	●	●	●	●	●
●●	●●	●○	●●	●○	●●	●●	●●
●	Optional	○	●	●	●	○	●
○	○	○	○	○	○	○	●
○	○	○	Optional	○	Optional	Optional	●
○	○	Optional	Optional	Optional	Optional	Optional	○
●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	○
70	150	100	350 100	100	250	250	250
50	100	50	250	50	100	100	150
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
11.3kg	19kg	16.3kg	12.7kg	16.3kg	16.3kg	16.3kg	14.5kg
PCL 4	PCL 5	PCL 5e	PCL 5e	PCL 5e	PCL 5e	PCL 5e	PCL 4
○	●	○	●	○	○	●	○
Adobe PostScript Level 2	Optional Adobe PostScript	None	Adobe PostScript Level 2	Adobe PostScript Level 2	Adobe PostScript Level 2	Optional Adobe PostScript Level 2	LaserMaster PostScript
17	N/A**	N/A**	35	35	35	N/A**	235
○	●	○	●	●	●	●	●
●	●	●	●	●	●	●	●
● (Windows)	○	● (included)	● (included)	● (included)	● (included)	● (included)	● (included)
One year onsite	One year onsite	One year	One year	One year	One year	One year	One year

Summary of features: Laser printers

● — YES ○ — NO	Lexmark IBM 4039 10R	Lexmark IBM 4039 10R Duplex	NEC Silentwriter SuperScript 610	NewGen ImagerPlus 12	NewGen Turbo PS/660 B	NewGen Turbo PS/660p
List price	$4166	$5242	$1500***	$17995	$8995	$3995
Distributor	Lexmark	Lexmark	NEC Information Systems	Practical Peripherals	Practical Peripherals	Practical Peripherals
Telephone	(02) 930 3500	(02) 930 3500	(02) 930 2000	(07) 839 1142	(07) 839 1142	(07) 839 1142
Physical characteristics						
Dimensions (HWD in cm)	30 by 37.8 by 53.3	30 by 37.8 by 53.3	11.9 by 37.1 by 35.6	21.6 by 48.3 by 71.1	30 by 46.5 by 53.3	19 by 34.3 by 14.4
Weight	18.1kg	18.1kg	7.7kg	24.9kg	19kg	10.4kg
Engine type	Laser	Laser	Laser	Laser	Laser	Laser
Engine model	Lexmark 4039	Lexmark 4039	NEC LCR50	Toshiba TN-7270	Canon BX	Canon LPB-LX
Maximum resolution in HP PCL (dpi)	300 by 300	300 by 300	300 by 300	300 by 300	300 by 300	300 by 300
Maximum resolution in PostScript (dpi)	600 by 600	600 by 600	N/A**	1200 by 1200	1200 by 1200	600 by 600
RISC processor	16MHz AMD Am29200	16MHz AMD Am29200	N/A**	25MHz Weitek XL8220	25MHz Weitek XL8220	25MHz Weitek XL8220
Rated engine speed (pages per minute)	10	10	6	8	8	4
Single-cartridgetoner/developer/drum	●	●	●	○	●	●
Toner capacity (images)	10000	10000	4000	5000	5000	3500
Standard/maximum RAM	2M/16M	2M/16M	256K/256K	40M/96M	12M/96M	6M/32M
Accepts standard SIMMs	●	●	○	○	○	○
Interfaces						
Parallel/serial port	●●	●●	●○	●●	●●	●●
LocalTalk port	Optional	Optional	○	●	●	●
SCSI port for hard disk	○	○	○	●	●	Optional
Ethernet	Optional	Optional	○	Optional	Optional	Optional
Token Ring	Optional	Optional	○	○	○	○
Automatic interface switching	●	●	○	●	●	●
Simultaneously active ports	●	●	○	●	●	●
Paper handling						
Capacity of each standard input cassette (sheets)	200	200	50	250	250	70
Capacity of each standard output tray (sheets)	250	250	50	150	250	150 (top) 70 (rear)
Can print on A3-size paper	○	○	○	●	●	○
Duplexing	Optional	●	○	○	○	○
Rated maximum paper weight	10.9kg	10.9kg	12.7kg	16.3kg	16.3kg	16.3kg
Fonts and features						
HP PCL support	PCL 5	PCL 5	PCL 4	PCL 4	PCL 4	PCL 4
Accepts HP-compatible font cartridges	●	●	○	○	○	○
PostScript language support	Lexmark PostScript	Lexmark PostScript	Optional (NEC SuperScript)	NewGen PostScript	NewGen PostScript	NewGen PostScript
Number of Type 1 fonts provided	35	35	None	35	35	35
Automatic emulation switching	●	●	○	●	●	●
Resolution enhancement	●	●	●	●	●	●
Printer-specific Windows 3.1 driver available	● (included)	● (included)	● (included)	● (included)	● (included)	● (included)
Customer support						
Warranty	One year onsite	One year	Two years	One year	One year	One year

N/A* — Not applicable: the product does not have this feature. N/A** — Not applicable: this unit is not a PostScript printer. *** — Pricing was not available at time of going to press. Pricing given is approximate

Okidata OL400e	Panasonic KX-P4440	QMS 420 Print System	QMS 860 Print System	Samsung Finalé Hi-Res	Star Micronics LS-5EX	TI microLaser Pro 600	TI microWriter
$1699	$2999	$3624	$3674	$3999	$2395	$3488	$1485
IPL Datron	Panasonic	QMS	QMS	Samsung Electronics	Star Micronics	Texas Instruments	Texas Instruments
(02) 698 8211	(02) 986 7400	(03) 899 5777	(03) 899 5777	(02) 638 5200	(02) 748 4300	008 024 853	008 024 853
24.1 x 32 by 49.5	28.7 by 36.8 by 39.4	66.3 by 34.8 by 39.4	30.5 by 48 by 52.6	24.1 by 43.2 by 43.2	25.9 by 34.3 by 40.6	33 by 36.6 by 32.5	26.4 by 35 by 37.6
7.7kg	18.1kg	11.8kg	23.6kg	23.1kg	13.6kg	14.5kg	15kg
LED array	Laser	Laser	Laser	Laser	Laser	Laser	LED array
Oki Electric	Matsushita 4440	Canon LPB-LX	Canon BX	Samsung F-8000	Fuji Xerox	Sharp JX-9660	Samsung
300 by 300	300 by 300	300 by 300	300 by 300	300 by 300	600 by 300	300 by 300	300 by 300
N/A**	N/A**	600 by 600	600 by 600	1200 by 1200 (effective)	600 by 300	600 by 600	300 by 300
16MHz MIPS R3000	16MHz Intel 80960	N/A**	25MHz Intel 80960CA	16MHz Intel 80960KA	16MHz Intel 80960SA	20MHz IPT 3051	N/A**
4	10	4	8	8	5	8	5
○	○	●	●	○	●	○	○
2000	3000	3500	6000	3500	4500	15000	2500
512K/4.5M	1M/5M	10M/10M	12M/32M	6M/18M	1M/7M	8M/22M	2M/4M
○	○	●	●	○	○	○	○
●●	●●	●●	●●	●●	●●	● Optional	● Optional
○	○	●	●	Optional	●	●	●
○	○	○	●	○	○	Optional	○
○	○	○	Optional	○	○	Optional	Optional
○	○	○	Optional	Optional	○	○	○
●	○	●	●	●	●	●	○
○	●	●	●	●	●	●	○
100	200	70	250, 100	250	250	250	250
100	100	50 (facedown) 20 (faceup)	250	250	150	250	200
○	○	○	●	○	○	○	○
○	○	○	○	○	○	○	○
15.9kg	15.9kg	12.7kg	16.3kg	15.9kg	12.7kg	15.4kg	15.4kg
PCL 4.5	PCL 5	PCL 4	PCL 4	PCL 5	PCL 5	PCL 5	PCL 4
○	○	●	○	●	●	○	○
None	None	QMS PostScript Level 2	QMS PostScript Level 2	Samsung PostScript	Optional (TrueImage)	Adobe PostScript Level 2	Adobe PostScript
N/A**	N/A**	35	35	35	N/A**	23	23
○	○	●	●	● (Windows only)	●	●	●
○	●	○	○	●	●	○	○
● (included)	● (via BBS)	● (included)	● (included)	● (included)	● (included)	● (included)	● (included)
One year five years on printhead	One year onsite	One year	One year	Two years onsite	One year	One year	One year

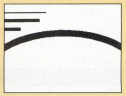
Okidata OL400e

APC MAGAZINE EDITORS CHOICE

4-ppm laser printer (Oki Electric engine) with 300-dpi output, HP PCL 4.5



Courier
Dutch
Swiss Bold



PCL Text Speed: 4.2 ppm
PCL Graphics Speed: 1.8 gppm

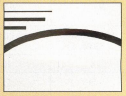
PCL WINDOWS APPLICATIONS:
Word for Windows: 3.9 ppm
CorelDRAW: 1.1 gppm
Lotus 1-2-3 for Windows: 2.4 gppm

Panasonic KX-P4440

10-ppm laser printer (Matsushita 4440 engine) with 300-dpi output, HP PCL 5



CG Times
Century
Courier
Univers



PCL Text Speed: 9.1 ppm
PCL Graphics Speed: 1.2 gppm

PCL WINDOWS APPLICATIONS:
Word for Windows: 7.6 ppm
CorelDRAW: 0.9 gppm
Lotus 1-2-3 for Windows: 1.6 gppm

QMS 420 Print System

4-ppm laser printer (Canon LBP-LX engine) with 600-dpi output, QMS PostScript Level 2, HP PCL 4



Courier ITC Zapf Dir
Helvetica Symbol
ITC Avant G Times Roma
ITC Bookm



PCL Text Speed: 3.8 ppm
PCL Graphics Speed: 1.1 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 3.5 ppm
CorelDRAW: 0.7 gppm
Lotus 1-2-3 for Windows: 1.3 gppm

PS Text Speed: 3.8 ppm
PS Graphics Speed: 0.4 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 2.9 ppm
CorelDRAW: 0.4 gppm
Lotus 1-2-3 for Windows: 1.7 gppm

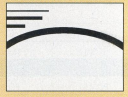
QMS 860 Print System

APC MAGAZINE EDITORS CHOICE

8-ppm laser printer (Canon BX engine) with 600-dpi output, QMS PostScript Level 2, HP PCL 4



Courier ITC Zapf Dir
Helvetica Symbol
ITC Avant G Times Roman
ITC Bookma



PCL Text Speed: 7.2 ppm
PCL Graphics Speed: 1.2 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 6.3 ppm
CorelDRAW: 0.9 gppm
Lotus 1-2-3 for Windows: 2.5 gppm

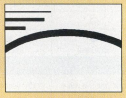
PS Text Speed: 7.2 ppm
PS Graphics Speed: 0.8 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 5.6 ppm
CorelDRAW: 0.7 gppm
Lotus 1-2-3 for Windows: 3.2 gppm

Samsung Finalé Hi-Res

8-ppm laser printer (Samsung F-8000 engine) with 1,200-dpi effective output, Samsung PostScript, HP PCL 5



BookAntiqua
BookmanOldStyle
CenturyGothic
CenturySchoolbook
MonotypeCorsiva
TimesNewRoman



PCL Text Speed: 7.5 ppm
PCL Graphics Speed: 2.4 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 6.8 ppm
CorelDRAW: 1.0 gppm
Lotus 1-2-3 for Windows: 3.2 gppm

PS Text Speed: 7.2 ppm
PS Graphics Speed: 0.4 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 3.9 ppm
CorelDRAW: 0.4 gppm
Lotus 1-2-3 for Windows: 2.2 gppm

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- ☐ Microcomputer Manager
- ☐ MIS Manager
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- ☐ Project Manager/Group Leader
- ☐ Engineer/Architect
- ☐ Accountant/Finance Officer
- ☐ Systems Analyst/Programmer Analyst
- ☐ Consultant/Adviser
- ☐ Other computer department employee
- ☐ Educator
- ☐ Sales Representative
- ☐ Other Professional
- ☐ Office Administrator
- ☐ Student
- ☐ Other (please specify)

2) What is your organisation's primary business activity?

- ☐ Government, Utilities
- ☐ Agriculture, Mining, Oil
- ☐ Transportation
- ☐ Construction
- ☐ Computer Manufacturer/Distributor
- ☐ Communications
- ☐ Computer Retailer/Reseller/Consultant
- ☐ Finance, Banking, Insurance
- ☐ Research & Development
- ☐ Engineering, Architecture
- ☐ Manufacturing (non-computer)
- ☐ Retail (non-computer)
- ☐ Publishing, Media
- ☐ Health
- ☐ Legal
- ☐ Armed Forces
- ☐ Other (please specify)

3) How much IT equipment do you anticipate being involved with the purchase of during the next 12 months at work? (Please include all hardware, software, peripherals, connectivity equipment and consumables)

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- ☐ $1,000 - $4,999
- ☐ $5,000 - $9,999
- ☐ $10,000 - $49,999
- ☐ $50,000 - $99,999
- ☐ $100,000 - $249,999
- ☐ $250,000 - $499,999
- ☐ $500,000 - $999,999
- ☐ $1,000,000+

4) How many microcomputers are you directly responsible for at work?

- ☐ None
- ☐ 1 - 9
- ☐ 10 - 19
- ☐ 20 - 49
- ☐ 50 - 99
- ☐ 100 - 499
- ☐ 500 - 999
- ☐ 1000 - 1999
- ☐ 2000 - 4999
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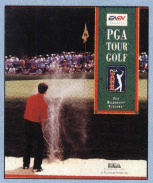
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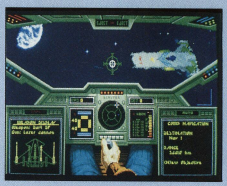


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Sound: Major cards
Disk: 3.5" only



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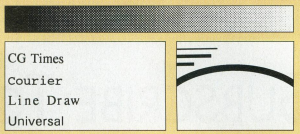
Requires: 640K of RAM, dual floppies or hard disk drive 12MHz+ AT
Video: VGA/MCGA (256 Colours)
Input Device: Keyboard/mouse, joystick recommended
Sound: Major cards
Disk: 3.5" only

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Star Micronics LS-5EX

5-ppm laser printer (Fuji Xerox engine) with 600- by 300-dpi output; HP PCL 5; Microsoft TrueImage PostScript emulator, $225





PCL Text Speed: 4.1 ppm
PCL Graphics Speed: 1.7 gppm

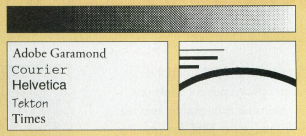
PCL WINDOWS APPLICATIONS:
Word for Windows: 3.9 ppm
CorelDRAW: 0.9 gppm
Lotus 1-2-3 for Windows: 2.3 gppm

APC MAGAZINE EDITORS' CHOICE

TI microLaser Pro 600

8-ppm laser printer (Sharp JX-9660 engine) with 600-dpi output, Adobe PostScript Level 2, HP PCL 5





PCL Text Speed: 4.5 ppm
PCL Graphics Speed: 3.2 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 2.9 gpm
CorelDRAW: 1.0 gpm
Lotus 1-2-3 for Windows: 2.7 gpm

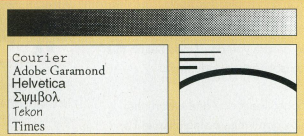
PS Text Speed: 8.3 ppm
PS Graphics Speed: 1.3 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 6.3 ppm
CorelDRAW: 1.3 gppm
Lotus 1-2-3 for Windows: 3.5 gpm

APC MAGAZINE EDITORS' CHOICE

TI microWriter

5-ppm laser printer (Samsung engine) with 300-dpi output, Adobe PostScript, HP PCL 4





PCL Text Speed: 4.5 ppm
PCL Graphics Speed: 1.2 gppm
PCL WINDOWS APPLICATIONS:
Word for Windows: 4.1 ppm
CorelDRAW: 0.9 gppm
Lotus 1-2-3 for Windows: 1.4 gppm

PS Text Speed: 4.4 ppm
PS Graphics Speed: 0.5 gppm
PS WINDOWS APPLICATIONS:
Word for Windows: 3.3 ppm
CorelDRAW: 0.5 gppm
Lotus 1-2-3 for Windows: 1.7 gppm



The NewGen ImagerPlus 12, NewGen Turbo PS/660 B, NewGen Turbo PS/660p

print manager. A PCL 4 driver is also included, but PCL-mode printing is available only from a Windows DOS session. PostScript emulation software is also available.

The printer relies on the host PC's resources for processing printer information, downloading fonts, and queuing jobs, so performance is dependent upon the host PC's memory, disk and CPU. In particular, the SuperScript 610 uses Windows' virtual-memory capability for processing page and font information and spooling print jobs.

Since the unit prints only from within Windows, we don't report results for our standard PCL speed tests. And on our Windows applications tests under PCL emulation it was an unexceptional performer. Performance was above average under PostScript emulation, however.

The printer has no external controls or display panel; its print manager provides access to basic control options and status screens. You can also select or deselect print operations using the Windows Print Manager. With the SuperScript print manager turned off, you get faster printing. Turn the print manager back on and you get a swift return to active applications. The SuperScript 610 has an US EPA Energy Star-compliant power-saving mode that kicks in after the printer is idle for a user-defined period.

NewGen ImagerPlus 12
NewGen Turbo PS/660 B
NewGen Turbo PS/660p

By Bill Dyszel

NewGen Systems' three new printers, all of which include NewGen's PostScript emulator, offer superb output quality. There's the impressive NewGen ImagerPlus 12, a 1200-dot-per-inch (1200dpi) A3-size printer ($17,995); the NewGen Turbo PS/660 B, a 600dpi A3-size printer ($8995); and the NewGen Turbo PS/660p, a 600dpi personal laser printer ($3995).

The printers share an automatic emulation and interface-switching feature, but it worked inconsistently on our tests. Also, all three NewGens were unable to complete our

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With all the talk going on, you'd be forgiven for thinking that just having a RISC processor on board a printer was reason enough to buy nothing else.

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Our new 4 pages per minute OKI OL400E also has all this fabulous RISC ASIC technology on board to print your project presentations, sales' reports, and mailers even faster to meet even the tightest of deadlines.

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The RISC technology means you'll get even the most complex of images created by Microsoft Excel for Windows, Microsoft Word for Windows, and WordPerfect for Windows printed faster, without the need for extra memory. You'll be able to use it as you unpack it, because it comes standard with a Centronics Parallel and an RS232C Serial interface, with automatic interface switching, 512Kb of RAM, 42 bit mapped resident fonts, and a font card slot. It uses our new technology micro fine toner for even crisper print definition. And it's the world's smallest page printer.

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The OKI OL400E has a RISC technology processor.

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It is a 4 page per minute printer with enhanced memory.

It comes with an auto switching dual interface.



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It comes with 42 bit mapped resident fonts.

The print head has a full five year warranty.

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Graphics are crisper with our new technology micro fine toner.

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SUDDENLY, OKI'S GOT NO COMPETITION.

There's no competition on warranty either, we have a 5 year warranty on our printhead.

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OKI

People to People Technology

Name. Send me details on the OL400E.

Company.

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PCL tests because of driver incompatibility.

The Turbo PS/660p uses a four-page-per-minute (4ppm) Canon LBP-LX engine, but demonstrated unusually strong PostScript performance for a low-cost personal printer. The unit includes 6M of RAM (expandable to 32M), as well as the 35 standard Type 1 PostScript fonts. The 8ppm Turbo PS/660 B uses a Canon BX print engine and 12M of RAM (expandable to 96M) to print on stock of up to 11 by 17in. Its performance on our tests was moderate.

The ImagerPlus 12 provides 11 by 17in full-bleed output on paper that is up to 12 by 19.5in. A Toshiba engine, which requires a two-unit toner/developer, prints at up to 1200dpi. Graphics output from the ImagerPlus 12 was very impressive; lines were crisp and clean and image contrast was excellent. PostScript performance was quite reasonable as well, thanks to the unit's Weitek XL-8220 controller and 40M of memory (expandable to 96M). NewGen offers plenty of upgrade options for these three new laser printers, including extra paper trays and Ethernet network interface cards.



The Okidata OL400e

Okidata OL400e

By Joseph Desposito

The Okidata OL400e is an aggressively-priced LED page printer with basic features. The PCL 4-compatible OL400e, a successor to the long-running OL400, targets value-sensitive buyers with its $1699 price tag. The printer employs an eight-button control panel with a 32-character LCD, and has separate drum and toner components. The 4ppm OL400e departs from the earlier OL400 models both in exterior design and print engine. At only 7.7kgs, the new unit is lightweight and has a small footprint of 24.1 by 32 by 49.5cms (HWD). Inside it uses a new Okidata Electric engine and a MIPS R3000 RISC processor.

The OL400e has four typefaces in various sizes. An adjustable paper cassette holds up to 100 sheets and a manual feed takes labels, envelopes and legal-size paper. A new power-saving mode used only 10 watts on our power consumption test when the printer was idle. The OL400e encountered cross-hatching compatiblity problems in HP PCL 4 mode; otherwise, it worked flawlessly. The OL400e was slightly faster than average on our Graphics Speed test and tested faster than its rated speed on the text speed test in HP PCL 4 emulation.

Panasonic KX-P4440

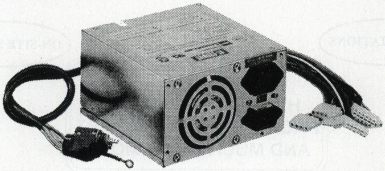
By Greg Pastrick

The $2999 Panasonic KX-P4440, a 300dpi PCL 5 laser printer built around a 10ppm



The 10ppm Panasonic KX-P4440

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Panasonic engine, has a traditional design. It supports a power-saving mode which kicks in after a programmable interval and cuts power draw to under 20 watts.

The KX-P4440 has 22 built-in fonts and Diablo 360, HP PCL 4, HP PCL 5, and IBM Proprinter emulations. The unit's standard 1M of RAM can be expanded to 5M. The printer doesn't include a resolution-enhancement feature, so fine lines tend to have a jagged look. The KX-P4440's performance on our Graphics Speed test was only average despite its speedy engine; on our Text Speed test, it turned in a strong 9.1ppm score. The KX-P4440 is best-suited for text-heavy printing needs.

QMS 420 Print System

QMS 860 Print System

By Joseph Desposito

Both the QMS 860 Print System and the QMS 420 Print System laser printers feature excellent 600-dot-per-inch (600dpi) print quality. The QMS 860 at $9674, is a notch better, thanks to ultrafine toner used by its Canon LBP-BX engine. The QMS 860 targets shared computing environments, while the QMS 420, at $3624, targets single users and small workgroups. Both models include 39 Adobe compatible Type 1 typefaces, and both support Adobe PostScript Levels 1 and 2, HPGL, and HP PCL 4 emulations. Both printers also perform emulation sensing and have simultaneously active parallel, serial and LocalTalk ports.

An eight-page-per-minute printer, the QMS 860 includes a 250-sheet paper cassette and a 100-sheet adjustable tray. It can accommodate 11 by 17in paper using an oversized paper cassette ($212). The QMS 860 scored close to its rated pages per minute on the text speed test, but did not distinguish itself on the graphics speed test.

The QMS 420 is a 4ppm printer built around a Canon LBP-LX engine and equipped with a 70-sheet paper cassette. On the graphics speed test it was noticeably slower than the QMS 860 in Adobe PostScript emulation.

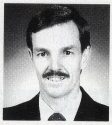
Samsung Finalé Hi-Res

By Bruce Brown

Based on the Samsung F-8000 eight-page-per-minute laser engine, the Samsung Finalé has a $3999 price tag. The Hi-Res part of the Samsung printer's name comes from its effective 1200-dot-per-inch printing in Adobe PostScript mode.

Samsung divides each 300dpi dot into

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The QMS 860 and 420 Print Systems

four quadrants and can address any one of four positions in each quadrant. The printer also includes Samsung Resolution Technology for smoothing jagged curves in graphics and text. In PostScript printing, the effective 1200dpi mode shows in high-quality graphic print samples with sharp, clean lines and excellent contrast ratios. Thirty-nine PostScript fonts are included in addition to 14 bitmap and eight scalable PCL fonts. The Finalé also contains its own TrueType rasteriser in firmware, eliminating the need for font substitution in Windows or TrueType rasterisation using software.

The Finalé Hi-Res proved speedy, especially in text printing, with text speeds of



The Samsung Finalé Hi-Res

7.2ppm in PostScript mode and 7.5ppm in HP PCL mode. HP PCL images printed at a rate of 2.4 graphics pages per minute and PostScript images printed at 0.4gppm.

Star Micronics LS-5EX

By Bruce Brown

Based on a Fuji Xerox five-page-per-minute (5ppm) laser engine, the Star Micronics LS-5EX, which sells for $2395, is a good choice in situations where budget and printing demands don't justify spending more on an 8ppm printer. With standard HPGL, HP PCL 4, and HP PCL 5 emulations; 14 bitmapped and eight scalable Intellifonts; and 15 True-Type typefaces, the LS-5EX is fully equipped for most text printing needs. An Adobe PostScript-compatible and True-Image emulation cartridge ($745) is also available.

The LS-5EX uses a convenient and clean one-piece toner, developer, and drum combination that is good for 4500 sheets. The printer's monthly duty cycle is 3000 pages with a 150,000-sheet life expectancy. Performance was reasonable with 4.1ppm text and 1.7gpm HP PCL 4 graphics printing speeds. Text and graphics quality were good, although contrast was not as defined as with some other printers we examined in this roundup.

A 50-sheet fold-down universal paper tray and a 250-sheet universal paper cassette come standard with the printer, so you can keep letterhead in the tray and blank sheets in the cassette. A third 500-sheet lower paper cassette is an option that costs $449.



The Star Micronics LS-5EX

250-sheet paper cassettes are included in the basic configuration.

The TI microWriter is a reliable, easy-to-use Adobe PostScript, HP PCL 4-compatible printer available in three versions: the $1945 microWriter PS23 with 23 Adobe PostScript fonts, the microWriter PS65 with 65 PostScript fonts ($2175 price tag), and standard microWriter that only supports HP PCL 4 ($1485). Both PostScript versions have a LocalTalk interface along with the usual Centronics parallel port, but automatic interface switching is not available. Automatic emulation switching between HP PCL 4 and Adobe PostScript is built in and worked seamlessly on our tests. The LED print engine scored 4.5 pages of text per minute and 0.5gppm in PostScript mode, and offered good quality, although graphics compatibility tests for HP PCL 4 showed some slight distortions.

The built-in 250-sheet paper cassette worked smoothly, while the manual paper cassette that comes with the microWriter for envelopes and non-standard paper does not attach firmly enough to the printer to keep it from falling off. For those users who frequently print envelopes and various sizes of paper, the problem can be solved with a $250 optional adjustable paper cassette. A $425 second paper cassette can be added to the bottom of the printer, and the driver software allows for the intelligent switching between cassettes for the use of letterhead paper and blank pages.

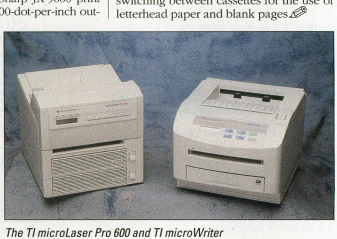
TI microWriter

TI microLaser Pro 600

By Bill Dyszel

Texas Instruments has introduced two new products, the TI microWriter ($1945 for the basic PostScript version), aimed at the budget-minded, and the $3448 TI microLaser Pro 600, targeted at high-quality graphics printing assignments.

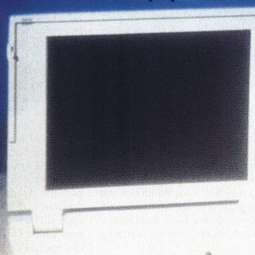
The TI microLaser Pro 600 offers PostScript Level 1 (with 23 fonts) and HP PCL 5 (with eight Intellifonts) emulations. The eight-page-per-minute Sharp JX-9660 print engine produces true 600-dot-per-inch output. Automatic emulation switching worked smoothly on our printer tests, as did automatic switching between the high-speed parallel port and LocalTalk port, which comes standard. Print quality was excellent, showing almost no distortion at small type sizes, no waviness in thin rules, and only slight banding in greyscale output. Two built-in



The TI microLaser Pro 600 and TI microWriter

Portable printers

Steppin' out



BY SCOT MCPHEE

Mobile computing is on the rise. But what hard copy options are available for these users? The seven portable printers in this review show how this market has matured.

I WAS SURPRISED by some of the printers submitted for review here, but also in some ways disappointed. None of the printers really leapt out and grabbed me by the throat, but all show the maturity that this market has developed. One of the problems in reviewing a market sector that's become mature is that the basic features of the products are the same, all the exciting advances were made years ago, and now the differentiation in products comes via quality of build and price.

Before you buy a portable printer, you should first ask yourself exactly what it is that you need to print out there in the field. I suspect that many of you who already have laptops might want to buy a portable printer, just because you already have a portable computer. But is this the right move? You should consider that if you don't need to print on the hop, then your needs may be better served by using a printer at your main base only.

Perhaps, after all, one of these portables is the one you'll buy: all of them are capable of being a desktop personal printer as well as doing the job on the road, but you could be excluding other perfectly good printers by deciding, a priori, that you need a portable.

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Australian Computer EDITORS CHOICE

■ HP DeskJet Portable

When all is said and done, there were only three printers in contention for the Editors' Choice: the Canon BJ10sx, the HP DeskJet Portable, and the Lexmark 4070IJ.

The Canon BJC-600 (although colour capable) and the Brother HJ400 don't run from batteries. The two Mannesman Tally printers, while exhibiting several innovative features, are too expensive to recommend unless you need the specific capabilities of these machines.

Of the three that are left, the HP DeskJet Portable gets the nod. Although its resolution is slightly lower than the other two at 300dpi instead of 360dpi — and it had a tendency to exhibit slightly more ink bleed, its print quality was sufficiently impressive that when combined with its very competitive price, made it extremely difficult to pass over. Added bonuses to this are its nice dark blacks, excellent styling, and generally thorough design.

None of this is to say the Canon and the Lexmark aren't great printers. They are, and if you should decide they suit your purposes, you won't be getting a dud.

The portability factor seems to be a powerful attractor for many people, but sometimes needlessly. I've had to advise several people recently against buying laptops as their first computer — most think a laptop is a neat idea without realising they would be paying a $1000 premium for portability when they didn't need it.

While not trying to discourage you from buying a portable printer here, consider your needs carefully before you rush out and buy something.

However, even if you decide that you need just desktop printing, then it may be that one of these portables is the one that fits the bill. In fact, for the quality of printing given, they're quite cheap — there doesn't seem to be the financial premium that is usually placed on miniaturisation. Some of them nearly compete on price with traditional impact dot-matrix printers!

If you decide that you really do need portable printing, there are several things you should then consider. First and foremost, will you need battery operation? Or are you going to operate the printer only in a hotel room or client office?

In all cases, I found it extremely difficult to print without a table or other firm, flat surface to rest the printer on. I, at least, had the benefit of using my desk for this test — add a laptop computer to this equation, and you have to be an octopus to manage it properly. Portable printing isn't something you do in a bus, taxi or plane — yet.

Another consideration is the type of documents you'll be printing. Will they be long, multipage reports? If so, perhaps you'll need a printer that contains an integral cut-sheet feeder — most of the detachable ones are far too bulky to take with you, although not impossible.

All of the printers reviewed here will do graphics, some more successfully than others. You should also consider the types of applications with which you will be using your printer. Most come with Windows drivers, or work with the standard ones that are supplied with Windows, but if you are using an obscure or custom application, then you will have to consider whether you can obtain (or write) a printer driver for it.

Macintosh Powerbook owners also have to consider carefully — they have a completely different type of plug to the 'standard' Centronics parallel interface. There are only two printers here which fit that bill, and one of those doesn't run off batteries.

Will you need colour? Not all people need to print colour while they're out on the road, but if you do, there's only one printer here that does it (but it doesn't use batteries). So if you're perhaps giving multimedia presentations to potential clients, and you want the ability to give them a colour print-out on the spot, perhaps the lack of battery operation isn't going to be a problem.

Also, you should consider the warranty available on each printer. For those who travel all over the world, you might like to consider whether the printer you are looking at has a worldwide warranty — after all, Murphy's Law dictates that your printer isn't likely to break down in Sydney or Melbourne, but places more like Vladivostok, Hanoi, or Jakarta. You have to be assured of finding a service representative in each of your main centres of travel.

Finally, the printers featured in this portable section are also covered in various other sections of major printer feature, that continues next month. Benchmarks and print-quality graphics will be reviewed there.

To round up, each printer reviewed here has individual strengths and weaknesses. There is no one correct choice — you should carefully weigh your options and decide on the best printer for your needs.

Brother HJ400

The Brother HJ400 inkjet is an anomaly in this portable printer review — it's not truly portable. Yes, it has a small footprint, but it's addicted to a 240V AC outlet via a power pack.

That said, it is at least luggable — it doesn't weigh much, and it's not very large. However, it is a pretty awkward shape to try and fit into a bag, and a briefcase is right out of the question.

What it does have to recommend it, is that it has both a serial port (suitable for a Mac) and a parallel port (suitable for a PC). Unfortunately, the interface doesn't support the AppleTalk network interface, so you can't connect this printer up between several Macs. You could also use the serial port with a PC, but you'd have to get hold of a special cable.

A cut-sheet feeder is fitted as standard on the Brother. This holds 100 sheets of paper. There were some occasional problems with it pulling a couple of pieces of paper through at once, however this may have been due to incorrectly loading the paper.

Brother supplies two disks with the printer — one with Windows drivers and TrueType fonts, the other with Macintosh drivers and TrueType fonts. There is a setup program on the Windows disk that makes

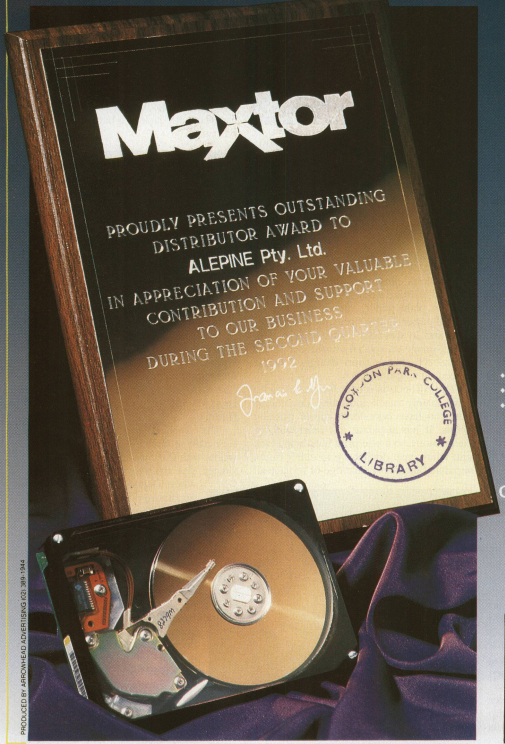


Although not a true portable, the Brother HJ400 is suited to inkjet printing from both Macs and PCs

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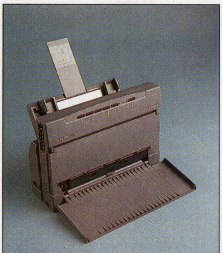
installing either the printer driver or fonts a fairly painless task.

Like most of the other inkjets featured here, it has a resolution of 360dpi. The print quality was okay, but there was some banding visible in the graphics. The integral ink cartridge/printhead looked identical to the one found on the Lexmark.

If you have both a Macintosh and a PC and you want to share the one printer between them (something not usually possible for printers this cheap), then at $659 this printer is worth a look. However, it cannot be recommended for truly portable printing with its difficult form factor and lack of a battery.

Canon BJ-10sx BubbleJet printer

The BJ-10sx is the heir to Canon's very successful BJ-10e series of bubblejet printers. According to Canon, the BJ-10 is Australia's single most popular range of printer, giving Canon the top banana in the non-impact printer market. The new model adds some extra speed, and a more robust case.



Better casing and extra speed make the BJ-10sx bubblejet a valuable addition to Canon's most popular range of printers

The BJ-10 (like many other portable printers) sits on one edge, like a book sitting up on its spine. An optional sheet feeder clips onto one side. There is much to like about this type of arrangement — it not only aids portability, but also means the printer occupies less desk real estate when used at home or in the office.

When you need to transport the printer with your notebook, you can simply unclip the sheet feeder and pop the BJ-10 into its black nylon carry bag for easy transport.

Print quality of the BJ-10 was fairly standard for a bubblejet. Basically it's the same as most of the other bubblejet printers, many of which, coincidentally, seem to share an identical print mechanism. The Canon shows signs of visible banding in large areas of black or dark graphics.

The cut-sheet feeder is available in two models — 30 or 50 sheets — for an RRP of $95 and $110 respectively. The printer itself retails at $745.

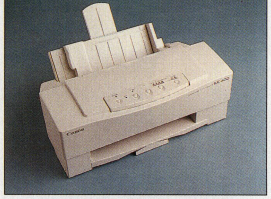
All-in-all, the Canon BJ-10sx is a very capable little machine. Certainly, improving the robustness of the casing is a welcome step — earlier models always felt too flimsy. You should definitely put it on your shortlist of portable printers.

Canon BJC-600 Colour Bubblejet

The Canon BJC-600 isn't really a portable printer — luggable would be a better description. It's certainly not a big machine, but it runs on AC power only and there are no optional bits you can leave in the office. However, it's probably the closest thing you'll get to a portable colour printer at this time.

As a colour printer, the Canon is impressive. Quality is good, as good as it gets for a bubblejet, and certainly as good as Hewlett-Packard's offerings. It prints quite well on plain paper, and even better on special paper. It also prints on transparencies, and in the near future will print in mirror-image on special translucent plastic sheets which are then designed to be placed on a light box.

The BJC-600 is meant for people who print mainly black-and-white documents but who have occasional colour printing needs. It has separate ink reservoirs for each colour, so if you print mostly in black and white, you don't have to either buy a separate black-only cartridge or replace all four inks when the black runs out. Canon claims the black cartridge will print 350 pages of black text at 1500 characters per page.



The BJC-600 bubblejet is about the closest thing to a portable colour printer you can get

While this is a great colour printer for the desktop, exactly why would you need a colour portable printer? Perhaps if you are giving sales presentations in the field and need to give print-outs to your customers (or produce last-minute colour overheads), you could find this printer useful. Certainly from the look of this machine it won't be long before the first true portable is made.

However, this machine is still tied to a power point, and is cumbersome to get into a briefcase or overnight bag, so it can't really be recommended as a general printer for all portable printing. That said, it's definitely worth considering for inexpensive colour desktop printing, or for those for whom the lack of a battery isn't such a worry.

Hewlett-Packard DeskJet Portable

Sometimes big surprises come in small boxes. It is amazing how small the basic DeskJet Portable inkjet printer really is. It is small enough to fit into an overnight bag with more than enough room left over for a thick novel, toothbrush and a change of clothes. You could probably fit it into a largish briefcase along with your notebook computer.

Small, however, doesn't mean it compromises on performance. HP is well known for its DeskJet series of printers, and the Portable is modelled on the DeskJet 500 (the brochure says to think of it as an HP DeskJet 500 printer with nimble feet. Hmm.).

The cut-sheet feeder makes the printer especially attractive — or rather, the way it works with the cut-sheet feeder does. You simply slot the DeskJet into the feeder when it's needed, or take it out for maximum portability. Sort of like a portable computer's docking station — only for printers.

The DeskJet is a well-designed machine and easy to use — something that cannot be said about some other printers which seem to feature lots of fiddly levers and non-obvious mechanics. And should you actually be confused about how to assemble and use it once you've ripped it eagerly out of the packing, you can always use your last resort — the clear, well-written and concise manual.

Print quality is okay for a inkjet. The resolution is 300dpi but because of the different print mechanism, this doesn't look as

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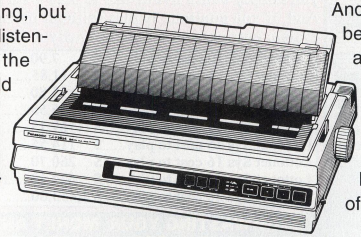
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The HP DeskJet Portable inkjet is small, but doesn't compromise on performance

good as a 300dpi laser printer. And although there was some ink bleed, the print quality was perfectly satisfactory for most applications.

The DeskJet runs on batteries. One battery and an AC power adaptor comes standard with it. The power adaptor also charges the battery but those of you who are real globetrotters can buy the Worldwide Rapid Recharger that charges two batteries at a time and operates automatically on any voltage, given the right plug adaptors. There is much to like about the DeskJet. Its low price — including paper feeder — of $509 makes it an attractive low-cost printing option, even for those with desktop computers.

IBM Lexmark 4070IJ

Lexmark, if you didn't know already, split from IBM a few years ago. It is amusing that although now a completely independent company, it still feels the need to trade under the familiar IBM trademark, for the time being at least.

Everything from the box to the manual's cover is adorned with IBM. The manual itself adheres to the traditional IBM style. The only identification of Lexmark are small logos on the box, the fine print in the manual, and the modest 'IBM 4070IJ by Lexmark' on the printer itself.

The printer is 'Manufactured for Lexmark International, Inc.' in Japan, by an unidentified manufacturer. It's made well, with some interesting features.

The 4070IJ is an inkjet printer, as are most of the printers reviewed here. It comes with a printer driver disk for Microsoft Windows and also Works. It has several emulation modes, including IBM Proprinter X24E, Canon BJ-130e and Epson LQ-510, so chances are if you use some obscure program without a proper printer driver, you can use one of these emulation modes.

The printer itself is finished in bone-white, which is a change from the usual range of greys that printers come in, but only just. One day perhaps they'll offer these things in a choice of colours.

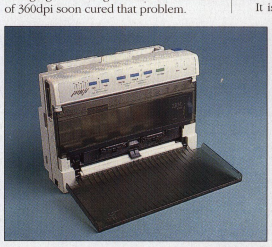
There are two well-written, spiral-bound manuals. One volume is the User's Reference, the other the Programmer's Reference. There is also a Quick Reference card, which is a very good idea, plus the few miscellaneous bits of paper that always seem to inhabit the boxes of these things.

Most people nowadays have absolutely no need to know all the Escape codes and other complex command and control sequences, so you can probably just put the Programmer's Reference to one side. If you're programming your own DOS-based database, for example, or if your program allows you to construct your own printer drivers, yes, you'll need it, but these types of programs are fast (thankfully) becoming extinct. With Windows, you simply use the supplied printer driver.

The printer, apart from its paper feeder, has some similarities with the HP DeskJet Portable. For instance, you use it in the vertical position, and it has a little swivel-out foot to keep it there.

Although the HP's cut-sheet feeder is technologically superior, the Lexmark's is a bit more logical. It simply clips on to one side.

Print quality is good for an inkjet. The Windows printer driver, however, installs itself with the medium resolution of 180dpi. At first this caused some consternation as everything came out pretty jaggy — but changing the setting to the best resolution of 360dpi soon cured that problem.



The Lexmark IBM 4070IJ has good print quality but suffers from its optional battery operation

The portability factor of the printer is quite high — without the paper feeder it is quite small, and could fit into a largish briefcase with a notebook computer quite easily.

The battery operation, however, lets the side down. For a start, it's an optional extra. No points there, Lexmark; this is after all meant to be a portable printer. There's a separate switch to turn the batteries on (which might be a pro or a con, depending on how you want to look at it). Worst of all, you can't use the printer and charge the battery at the same time.

Aside from this, the Lexmark 4070 is a very good choice for portable printing needs — particularly if Lexmark adopts some if its sibling's more aggressive pricing policies and shaves a bit off the $699 price tag.

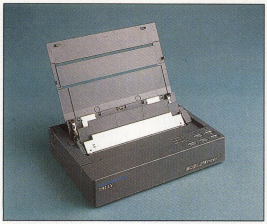
The Mannesman Tally is a portable PostScript printer, the only one reviewed here, and comes complete with an AppleTalk interface for Powerbook owners.

Mannesman Tally MobileWriterPS & MT735

The Mannesman Tally MobileWriterPS is a very special little printer. It's a portable PostScript printer, the only one reviewed here, and comes complete with an AppleTalk interface for Powerbook owners.

It is surprising no-one has yet made a portable PostScript printer. PostScript, while being slower than most other printer control methods, allows scalable fonts and many other complex printing options. Most high-end printers and typesetting machines (and increasingly, low-end personal laser printers) use PostScript as their native language.

PostScript demands quite a lot out of a printer — for instance, a lot of memory, typically 2M or more. It's also slower to send to the printer, because it uses human readable commands instead of abbreviated codes and numbers. But PostScript is becoming the standard way of talking to printers as it's essentially device-independent.



Mannesman Tally's printers offer portability for PostScript at a price

The same PostScript output sent to the MobileWriterPS, can later be sent to a high-resolution typesetting machine, with the corresponding increase in print quality.

The MT735 is the almost-identical twin of the MobileWriter, except it has neither PostScript nor the AppleTalk interface. It has a LaserJet II emulation, so it is compatible with a wide range of software, including Windows. However, the MT735 also lacks the internal scalable fonts that come standard with PostScript.

The printers are a quite compact design, if a little heavy (due mostly to the battery). They have an integral sheet feeder which can be folded out, or left closed so you can feed it one page at a time. This is a good idea — for instance, some other printers require you to leave a separate cut-sheet feeder at base if you want truly portable printing.

At first, the feeder was a bit confusing to set up. And unfortunately the manual wasn't much help: in fact, nearly useless — poorly written with illustrations far too small.

The printers use a thermal print mechanism with a special ribbon, which is also a bit fiddly to change. The ribbon does 150 pages before it runs out.

Text output from these machines is superb, as long as you use the special thermal paper. The text appears really crisp and black. Pictures however weren't as nice — they tended to be too black. There is a print density switch on the front panel which helps, but you will have to fiddle around a bit with it and your printer driver's settings in order to get the best output.

A Macintosh disk is supplied with the MobileWriterPS; Windows users can use the default PostScript printer driver that comes with Windows itself. At $1995 for the MobileWriter and $1695 for the MT735 these printers are a bit on the pricey side, but if you are really keen for excellent text output and PostScript printer features on the road (which Apple PowerBook and portable Sparc workstation owners will certainly be), you should definitely consider the MobileWriter as one of your options.

Summary of features: portable printers

	Brother HJ400	Canon BJ-10	Canon BJC-600	HP DeskJet Portable	Lexmark 4070IJ	Mannesman Tally MobileWriter-PS	Mannesman Tally MT735
Distributor	Brother Industries	Canon Australia	Canon Australia	Hewlett-Packard Australia	Lexmark International	Mitsubishi Electric Australia	Mitsubishi Electric Australia
Telephone	(02) 887 4344	(02) 805 2000	(02) 805 2000	131347	(02) 930 3600	(02) 684 7261	(02) 684 7261
Weight[1]	3.9kg	1.7kg	4.5kg	2kg	2kg	3.8kg	3.8kg
Dimensions (WHD)[2]	365 by 310 by 275mm	310 by 48.5 by 221.3mm	410 by 184 by 253mm	310 by 65 by 146mm	216 by 51 by 310mm	290 by 59.5 by 220.5mm	290 by 59.5 by 220.5mm
Print method	Thermal inkjet	Bubblejet ink on demand	Bubblejet ink on demand	Plain paper drop on demand thermal inkjet	Thermal inkjet	Thermal transfer page imaging	Thermal transfer page imaging
No. of jets in head	64	64	64 per colour	64	64	N/A	N/A
Claimed cps[3]	110cps at 10cpi	110cps at 10cpi	170cps at 10cpi	167cps at 10cpi	not supplied	N/A	N/A
Claimed ppm[4]				2ppm		6ppm	6ppm
Max. resolution	360 by 360dpi	360 by 360dpi	360 by 360dpi	300 by 300dpi	360 by 360dpi	300 by 300dpi	300 by 300dpi
Emulations	Proprinter X24e Epson LQ-510 Brother HJ-400	Epson LQ-510 Proprinter X24e BJ-130e	BJ-10 Epson LQ-2550 Canon Extended	PCL Level 3	Epson LQ-510 Proprinter X24e Canon BJ-130e	PostScript HP LaserJet II	HP LaserJet II
I/O Interfaces	Centronics parallel Serial (RS-232c/RS422A)	Centronics parallel	Centronics parallel	Centronics parallel	Centronics parallel	AppleTalk Centronics parallel	Centronics parallel
No. of pages in feed	100 sheets integral	30 or 50 sheets	100 sheets integral	50 sheets	50 sheets	80 sheets integral	80 sheets integral
Claimed battery life	N/A	40 mins contin. use	N/A	100 pages	not specified	150 pages	150 pages
Rec. Retail Price[5]	$659	$745	$1695	$509	$699	$1995	$1695

1 without cut-sheet feeder
2 at the smallest printing configuration possible: ie without sheet feeder if optional
3 characters per second at best text quality
4 pages per minute at best print quality — where blank figure not available
5 including tax

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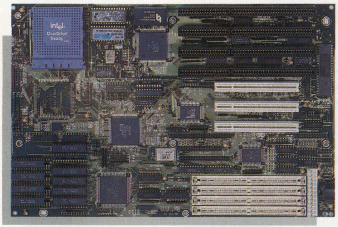
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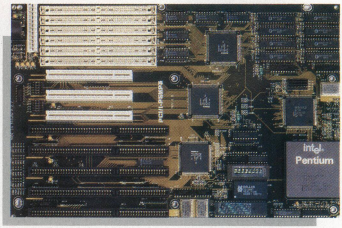
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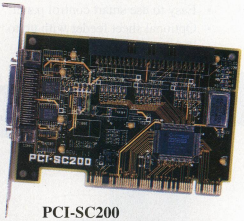


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DEALERS ENQUIRY WELCOME

PCI LOCAL BUS HAS ARRIVED



BY DAVE ROWELL

PCI technology, with the potenital to break the PC data logjam, may redefine the PC bus. Superior performance, user friendliness, and a path for future upgrades make the PCI bus the bus of tomorrow.

Add the letters 'PCI' to the long list of acronyms in your personal computer vocabulary. These three innocent-looking letters may soon have a stunning impact on how fast your computer operates. The Peripheral Component Interconnect standard is the newest in local-bus technology and, after a long gestation period, has finally made its way into mainstream desktop personal computers. While high-speed video and hard-disk performance via VL-Bus or proprietary local-bus expansion slots have been available for a while, PCI raises the roof on data throughput to impressively high levels.

How high? PCI technology has the power to bring colour-filled, high-resolution, full-motion video in multiple windows to your screen. It can provide add-in cards that configure themselves, and it offers top-notch hard-disk throughput. PCI's abilities and the way it works will have a profound impact on the shape of the PC industry for the near future.

History of the PC expansion bus



1981 **IBM PC**

The original IBM PC debuts with 8-bit, 4.77MHz expansion slots. In 1984 this kind of bus is extended to a 16-bit, 6MHz design now known as the ISA (Industry Standard Architecture) bus with the introduction of the IBM AT and its 16-bit 80286 processor. The ISA bus is later upgraded to 8MHz. Despite numerous predictions of its imminent demise, the ISA bus remains the most popular and most compatible PC expansion bus.



1987 **IBM PS/2 50**

IBM introduces the 16 and 32-bit Micro Channel Architecture (MCA) buses, which are incompatible with ISA peripherals but far more robust. In the same way that IBM's OS/2 is supposed to revolutionise operating-system software and retire DOS, the MCA design — a key feature in many of IBM's PS/2 PCs — is supposed to put ISA out to pasture. Of course, that has not happened.



1988 **Compaq Deskpro**

The 32-bit Extended Industry Standard Architecture (EISA) bus debuts as a PC-industry response to MCA. EISA slots retain the basic design of ISA slots but are made deeper to accommodate a second, lower row of contacts. ISA cards fit into EISA slots but are only deep enough to reach the first row of ISA-compatible contacts. EISA cards reach both rows of contacts. Thanks to the complexity and expense it adds to motherboards, EISA also fails to unseat ISA as the standard bus of choice.

Compared with the VL-Bus and other local buses, PCI offers higher performance, automatic configuration of peripheral cards, and superior compatibility. On the downside, it's likely to be expensive and to appear at first on high-end systems only, which will require the best and fastest video.

The wide acceptance of Microsoft Windows 3.1 and IBM's OS/2 2.1 has made local-bus expansion slots a must-have feature in PCs. Simply put, the amount of graphics data required by Windows and OS/2 applications has overwhelmed the data-throughput capacity of Industry Standard Architecture (ISA), Micro Channel Architecture (MCA), and Extended Industry Standard Architecture (EISA) expansion buses.

To get around this data bottleneck, PC designers bypassed these standard expansion buses by hooking the graphics display control circuitry directly onto the 486 CPU's local bus.

Since the video circuitry, and often the hard-disk controllers of local-bus PCs, reside on the same signal lines the CPU uses to access DRAM memory, these peripherals can operate at the CPU's full clock speed over a 32-bit wide data path. This translates into excellent performance with higher resolutions, more colours, and quicker screen-refresh rates, and it opens the PC to full-motion video, which usually overwhelms conventional bus technology.

With current local-bus systems, graphics performance is limited only by CPU and graphics chip performance — not by the bus between them. Until recently, local bus meant either a proprietary system that was limited to a specific vendor or VL-bus, a peripherals interface standard established last year by the Video Electronics Standards Associations (VESA).

Unfortunately, the VESA VL-bus design philosophy was to keep costs and development time down by tapping directly into the 486 bus with as little added design baggage as possible. Today, PCI goes a step further with a technically more elegant solution to the problem of displaying more information faster.

PCI: Performance first

The need for speed is apparent. While personal computer processor performance has improved nearly a hundredfold since the original IBM PC in 1981, I/O bus throughput has risen only fivefold, going from the PC's 8-bit 4.77MHz bus to the AT's 16-bit 8MHz bus. The AT bus, now called the ISA bus, provides a maximum throughput between 4M per second and 8Mbps on most systems.

Compared with the VL-Bus and other local buses, PCI offers higher performance, automatic configuration of peripheral cards, and superior compatibility.

Advanced buses such as MCA and EISA provide improved data throughput — short bursts as fast as 33Mbps with EISA and potentially faster with some Micro Channel designs — along with other efficiencies such as bus mastering. But limited availability, design complexity and high production costs have relegated these elegant solutions to servers and specialised systems.

First and foremost, PCI will mean an added performance boost for PCs without burdening the PC's processor. A PCI bus running at 33MHz can move data at a peak rate of 132Mbps during data bursts. In practice, Intel's PCI chipset can currently sustain throughput of 80Mbps for long data transfers — 10 times an ISA system's capability. This fast, wide bus is exactly what is needed to feed a hungry multimedia application.

For instance, PCI can handle 24-bit true-colour graphics at 30 frames per second, the minimum for full-motion video. It takes about 2.3M of data to draw each frame. At 30 frames per second, this adds up to nearly 70Mbps of full-motion video, which overwhelms conventional buses, resulting in jerky video as frames are randomly dropped. The PCI standard will not be limited to video, with peripheral-makers readying hard-disk controllers and networking cards that will further speed up PCs.

The present PCI specification is evolving from its original 32-bit bus to 64 bits, but 64-bit PCI systems and peripherals won't be available until next year. The maximum data rate will double to 264Mbps, enough to handle HDTV (high definition television) and real-time 3D rendering. The PCI specification handles the 64-bit upgrade path very nicely: A 64-bit PCI expansion card works in a 32-bit slot and vice versa, even though the 64-bit slot is longer.



Dell XPS series

1992

The VESA VL-Bus specification is announced by the Video Electronics Standards Association (VESA) as an attempt to end local-bus chaos. Early 32-bit local-bus video controllers could only be used with a particular vendor's machines. The VL-bus standard covers major design concerns but does not resolve all compatibility issues. The VL-Bus expansion slot is usually used in tandem with a standard ISA or EISA slot.

1993

The PCI bus finally turns up in PC hardware. Instead of actually residing on the CPU bus, the PCI bus fits neatly on a 'mezzanine' level between the CPU bus and peripherals. The exacting nature of the PCI specification and of its ability to exploit the power of the Pentium processor gives it the potential to be the fastest and most compatible bus for mainstream PCs.

Mezzanine seats

Strictly speaking, PCI isn't a true local bus at all but a *mezzanine* bus. The PCI bus is one step removed from a system's processor bus; it occupies an intermediate level between the processor bus and standard expansion buses such as ISA, EISA or MCA, with electronic bridges spanning the gap.

In an ISA-PCI system, for example, the ISA control logic will be one of the PCI devices on the PCI bus (see the diagram). Like the PCI controller, the ISA expansion bus interface is called a bridge because it translates signals from one bus to another.

By isolating the PCI bus from the CPU's local bus, a PCI design can support more devices than a VL-Bus design because PCI devices don't electrically load down the CPU bus. Most VL-Bus systems support two or three local bus peripherals, adequate for current needs, but maybe not for the future. The PCI specification allows up to 10 'loads' on the PCI bus, which can translate into as many as 10 integrated devices, but fewer than 10 expansion cards. A PCI rule of thumb conservatively counts two loads to one card. In addition, the PCI controller itself and any expansion bus bridge on the PCI bus each counts as one load.

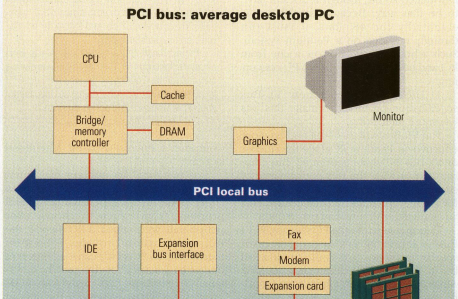
A typical PCI system will provide three slots plus up to two built-in devices such as a video controller or a SCSI-2 host adaptor. Rules were made to be broken, however, and sophisticated system designers can ignore the rule of thumb and design for more PCI devices, as long as the bus still meets the PCI electrical specifications. While there is currently no need for so many PCI peripherals in most systems, PCs can still support multiple PCI buses, if the need arises in the future.

By contrast, the VL-bus load limit varies with bus speed. The specification allows up to three expansion slots on a 33MHz 486 local bus, but fewer devices at higher clock speeds where signal timing becomes more critical. System designers exceeding these guidelines run the risk of distorting the signals on the local bus to the point of erratic operation. VL-Bus designs can buffer devices to provide bus isolation and thereby increase the number of supported devices, but buffering adds wait states and degrades performance.

If not properly implemented, isolating the processor from the PCI bus can create potential delays in any transaction between a CPU and devices on the PCI bus. Intel, which designed the PCI bus and has been its main proponent, has designed PCI chipsets to overcome this effect by clever use of read and write buffering at the bridge interface. (Other companies such as VLSI Technology, OPTi and Silicon Integrated Systems have announced or are developing PCI chipsets).

With Intel's chipset design, the CPU can now write data to a device and the PCI controller can then store the data immediately in its buffer, letting the CPU quickly go to the next operation rather than wait for completion of the transfer. The buffer then feeds the data to the PCI device in efficient bursts. If the CPU is writing a series of bytes to a device, the start of the transfer will be delayed, but there will be no delays between bytes with traffic lights locked on green.

Buffering like this is optional, and it's likely to appear at first on high-performance systems and to cost extra compared with other local-bus designs. Other chipset manufacturers, like OPTi and VLSI, are promising similar methods of operation that they say will meet or exceed the level of PCI performance created by Intel.



The PCI bus (centre) is separated from the CPU local bus (top left) by a bridge/memory controller. This allows the PCI bus to handle a number of peripherals without overloading the CPU local bus

PCI, Pentium, and beyond

Generally speaking, the overall performance of the PCI and VL-Bus standards on 486 systems is about equal for both read and write operations. While most of the systems sold in 1994 will have 486 CPUs, it is in Pentium systems where the technical capabilities of PCI will overtake the VL-Bus.

First, the VL-Bus loses the advantage of a direct CPU connection because the VL-Bus is specifically a 486 bus. This means that system-board designers must buffer the VL-Bus, slowing down the system for Pentium. Also, Pentium local-bus speeds, at 60 and 66MHz, are too fast for more than one integrated VL-Bus peripheral. (The more typical design runs the VL-Bus at 33MHz, which allows for more VL-Bus peripherals.) In addition, on a high-performance system running a true multitasking operating system such as OS/2, Windows NT or Unix, PCI gains the upper hand in performance, thanks to its ability to work concurrently with the CPU. This allows the CPU and PCI bus to chug along simultaneously.

On current VL-Bus designs, however, the CPU can't operate independently when a VL-bus device is active, potentially bogging down the processor. That also holds true on the VL-Bus Pentium systems introduced so far, though it doesn't have to be that way. Because the VL-Bus is essentially the 486 bus, it must run through a bridge on a Pentium system. Such a bridge could borrow a cue from PCI and be designed to allow CPU concurrency.

At the same time, a new VL-Bus specification promises to make this bus war more interesting.

The VL-Bus will go 64-bit and be more effective on Pentium PCs (see the sidebar on VL-Bus 2.0), but Pentium/VL-Bus chipsets that provide the bus performance of current Pentium/PCI chipsets won't arrive for a while, and buffering negates any cost advantage the VL-Bus had on 486 PCs.

Taking a step into the PC's future, PCI's bus isolation allows faster processor speeds. In theory, you could hook a PCI bus to a 100MHz Pentium or a 200MHz Alpha RISC processor, where a true local-bus connection to the CPU would be electronically out of the question. This processor independence is a boon from the system manufacturer's point of view, because it reduces development cost by allowing use of peripheral bus components with little redesign across several generations of a CPU. Because the PCI bus looks the same regardless of CPU, the same PCI peripheral card or chip should work equally well in 486, Pentium, Digital Equipment's Alpha, and eventually Apple Computer's PowerPC-based Macintosh systems.

For instance, to owners of Digital Equipment's Alpha PCs, PCI means a larger pool of less expensive peripheral products from which to choose. For peripherals with onboard ROM code, the PCI specification provides a boot-up mechanism so PCI cards can load different operating routines for different host systems. That means that cards with ROM programs will have to provide the built-in I/O routine specific to each platform. Digital, however, gets around this requirement by using its powerful Alpha processor to emulate Intel x86 ROM routines for PCI, ISA and EISA cards. Any PC card should just plug in and work.

Self-configuration, finally

PCI peripherals know who they are and are truly auto-configuring. A PCI board has configuration specifications set in memory onboard and provides installation information to the system during the boot-up phase of starting a system. BIOS routines then automatically configure each PCI device around the resources already in use by other boards. Ideally, you should never have to touch switches or jumpers in a PCI system.

Non-PCI boards will work in PCI systems, but that isn't as easy. The PCI system must know what's going on with such peripherals before it can configure PCI devices around them. This can be a problem with ISA cards.

The short-term solution for existing ISA cards comes from PCI-configuration utilities that let you log in and store in flash memory the configuration needs of each of your ISA, EISA, or Micro Channel adaptor boards.

By the end of this year, we should see ISA cards that adhere to an auto-configura-

VL-Bus 2.0 and future prospects

BY DAVE ROWELL

Challenged by the arrival of PCI-compatible products, supporters of the VL-Bus did not roll over and play dead. By the time you read this, VESA's VL-Bus committee will have ratified VL-Bus 2.0, an updated local-bus specification.

VL-bus 2.0 adds key features that make PCI suitable for Pentium systems. One is support for maintaining *cache coherency* when the CPU uses write-back caching, something the Intel 486 doesn't have but the Pentium does. (Cyrix has a 486 chip with internal write-back caching.) The VL-Bus 1.0 design reserved signal lines for cache coherency, but VL-Bus 2.0 actually implements it.

Like PCI, VL-Bus 2.0 adds support for 64-bit peripherals, a match for the Pentium's 64-bit data bus. Cleverly, 64-bit VL-Bus expansion cards have been designed to use the same connector as existing 32-bit VL-bus cards by multiplexing the address lines to get 64 data lines. Also like PCI, the new VL-Bus specification provides for upward and downward compatibility between 32-bit and future 64-bit systems and expansion cards.

Though the VL-Bus is essentially an extension of the 486 local bus, VL-Bus specifications always allowed for the isolating of devices from the CPU local bus. Unfortunately, doing so has meant poorer performance and added expense.

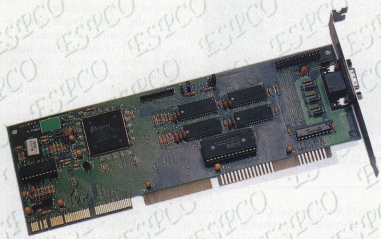
To make the benefits of bus isolation feasible, including CPU concurrency and easy use with advanced CPUs such as Pentium, the VL-Bus 2.0 specification, for example, adds support for packaging data in bursts. As with PCI, a combination of buffering and bursting can essentially mask the delays coming from bus isolation.

To address criticism that the VL-Bus specification lacks "robustness", the VL-Bus 2.0 defines electrical timing specifications for 33MHz, 40MHz and 50MHz operation and enhances the timing guidelines provided in the VL-Bus 1.0 specification. The VL-Bus 2.0 specification also allows for 3.3V peripherals, but only with peripheral chips integrated into the system board.

The new VL-Bus guidelines don't provide for auto-configuration, however. VESA here will depend on existing EISA and MCA autoconfiguration features and on the upcoming plug-and-play ISA specification.

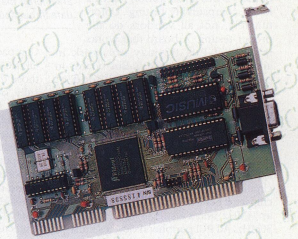
VL-Bus 2.0 changes allow design of VL-Bus/Pentium systems with performance similar to PCI ones. The question is whether chip and peripherals makers will support VL-Bus 2.0. Such systems would have no benefit over PCI Pentium systems beyond an ability to use existing VL-Bus cards, and existing cards wouldn't offer great performance because they don't support bursting.

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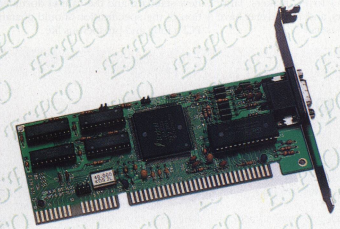
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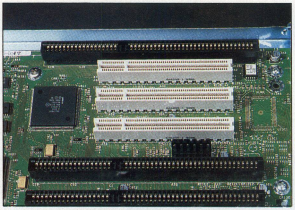
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tion standard that was developed by Microsoft, Intel, and a number of other manufacturers. This ISA standard will also make VL-Bus cards auto-configuring.

PCI systems and peripherals should also provide more reliable interoperability than their VL-Bus counterparts. The detailed nature of the PCI specification and the isolation of a PCI bus from a CPU bus help in this regard. The PCI specification describes the logical, mechanical, and electrical characteristics of a PCI bus in minute detail. In contrast, the loose nature of the VL-Bus specification forces a lot of compatibility testing. Unfortunately, not all vendors do the proper testing. A board that works in one VL-Bus PC may not work in another. Installing two VL-Bus boards in one PC increases the likelihood of problems.



PCI expansion slots, like the three white slots shown here, are shorter than standard ISA slots, yet provide far superior data throughput

Speedy, not power-greedy

PCI's bus independence lets it run at a different speed from the CPU bus. The two speeds may be related, but that depends on circumstances. With Intel's Pentium PCI chipset, a 66MHz system will run a PCI bus as 33MHz, and a 60MHz system will run at 30MHz. All PCI peripheral devices must be able to run at 33MHz, but with an ability to come to a dead stop for use in power conservation.

Breaking the processor-peripheral connection will allow hybrid systems that come equipped with 3.3V CPUs and 5V accessories to simultaneously cut power consumption and heat production.

The PCI's bus isolation allows for such hybrid designs, but a true local-bus design like the VL-Bus doesn't permit these designs without buffering, which can hurt performance by adding delays to every bus transaction. But the VL-Bus will be able to take advantage of future 3.3V CPUs that are 5V tolerant.

In fact, PCI defines both 3.3V and 5V expansion cards. The difference between the two types of cards comes down to the placement of a small cut-out in a card's bus connector.

The position of the cut-out prevents users from plugging a card of the wrong voltage into the motherboard. To ease the transition from 5V to 3.3V PCI buses, hardware vendors can design universal cards that plug into and work with either 3.3V or 5V PCI slots.

Local bus bandwagon

Who has jumped on the PCI bandwagon? Influential computer companies like IBM, Compaq Computer, Hewlett-Packard, Digital, NCR and Texas Instruments are among those that are pushing PCI strongly. Ironically, one of the biggest PCI proponents is Apple, which plans to use PCI eventually to replace NuBus on PowerPC-based Macs. NuBus won't be phased out immediately; the first generation of PowerPC-based Mac computers will still offer NuBus. The most important outcome of this is that the Mac world can now choose from standard off-the-shelf PC peripherals instead of being limited to the Macintosh-only NuBus architecture.

Developers at Intel are doing their best to ensure that PCI develops a life of its own. The intent is to make PCI as universal a bus as possible and avoid the paths paved by the EISA and Micro Channel bus standards, both of which are very advanced, but neither of which ever won broad public acceptance on the desktop. Intel has been busy marketing PCI to PC makers, large corporate customers, and, as you may have noticed lately, end users.

Contributing also to PCI's long development has been the complexity of implementing PCI support on motherboards and perhaps the apprehension concerning Intel's control of the specification.

Basically, system-board builders have been waiting on Pentium-PCI and 486-PCI chipsets from Intel, though other companies are now providing competing products.

To allay fears of one-company domination, Intel formed an industry group, the PCI Special Interest Group, to control the specification and made several of its PCI-related patents available royalty-free.

The fact that PCI exists as a local bus at all is a quirk of fate. Announced at the same 1992 PC Expo trade show as VL-Bus, PCI products are only appearing now, over a year later. That's partly because PCI started as an interface to integrate peripherals onto motherboards; the 1.0 specification didn't even provide for expansion slots.

Triggered perhaps by the success of the VL-Bus, the industry group overseeing PCI released the new Revision 2.0 specification last May that provides for expansion slots, along with forward-looking options for 3.3V operating and 64-bit data access.

There is no doubt that PCI will live up to its performance billing and provide a high-end alternative to more developed local-bus systems. Whether PCI will be the bus of choice for the masses or the domain of a small clique of power users remains to be seen.

Beyond that, vendor support for the new standard and the careful documentation of the specification should guarantee PCI a long and prosperous life.

HIGHLIGHTS

PCV vs VL-Bus

- PCI offers performance superior to the VL-Bus on Pentium systems. At the 486 level, PCI and the VL-Bus give essentially equal performance.
- PCI provides an elegant hands-off autoconfiguration system. PCI peripherals configure themselves at boot-up. For similar ease of use, the VL-Bus awaits the developing ISA plug-and-play standard.
- PCI promises excellent compatibility because of its tightly defined specification and some extensive simulation testing. The VL-Bus's more loosely defined specifications cause compatibility problems
- PCI systems will initially cost more than equivalent VL-Bus systems at the 486 CPU level. Still, there will be no price difference on Pentium PCs.
- PCI should eventually lower manufacturing costs, since it can be used with many types of CPUs with few design changes.
- PCI cards require just one small connector. VL-Bus cards are long and must be carefully inserted into an ISA or EISA socket, as well as a VL-Bus extension slot.

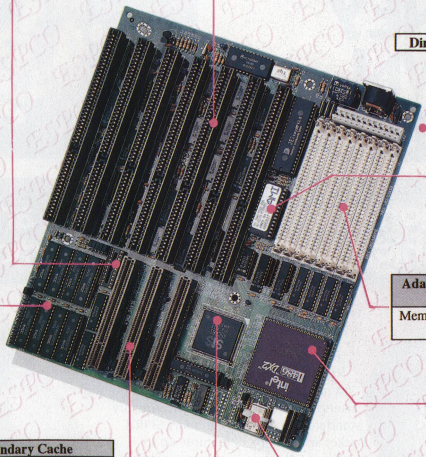
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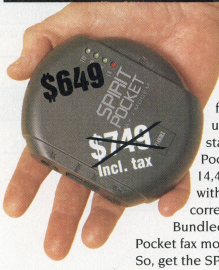
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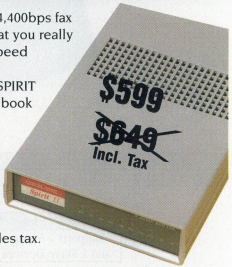


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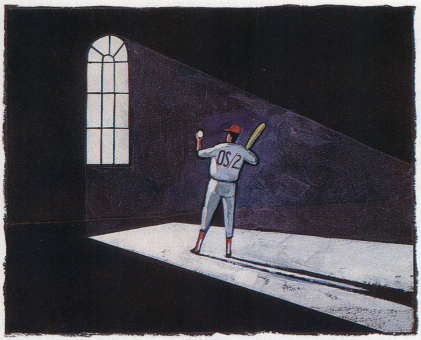
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OS/2 2.1:

A user's perspective



ARE YOU FEELING CRAMPED BY DOS/WINDOWS? GIVE OS/2 A TRY.

BY STAN MIASTOWSKI

For a few minutes, let's forget the politics, the personalities, and the seemingly interminable corporate bickering associated with The Great Windows versus OS/2 Controversy. The subject at hand is OS/2 2.1 . . . from a decidedly user-oriented perspective. While it's tempting to throw down the OS/2 versus NT gauntlet, the more apt comparison for most PC users right now is OS/2 2.1 versus Windows 3.1.

If you're a Windows user attempting to make a decision on whether to make the move to OS/2, the obvious question is whether OS/2 2.1 really delivers a 'better Windows than Windows' (as IBM is so fond of saying). The answer: a resounding 'It depends.' The more you do with Windows, the more advantages you can get from 2.1. If you place yourself in the power-user category, run numerous Windows applications simultaneously, are comfortable tweaking INI files, and still depend on multiple DOS applications, OS/2 2.1 offers many advantages. On the other hand, if you don't push Windows to its limits, you're just as well off staying with it.

Strong foundations

Windows 3.1 and the Windows that runs in OS/2 2.1 – dubbed Win-OS/2 – are virtually identical. Windows compatibility also existed in OS/2 2.0. The problem was that it included Windows 3.0 at the same time that Microsoft was shipping 3.1. With OS/2 2.1, things are on a more even keel.

One of the biggest advantages that OS/2 2.1 offers is that Win-DOS runs on top of a true 32-bit operating system, using a 386 or 486 processor to nearly its full potential. OS/2 is a full-fledged preemptive multitasking operating system. Windows, DOS and OS/2 applications all run in their own protected-mode sessions, guarded from the slings and arrows of overlapping application problems. If one crashes, the others are usually unaffected. (In certain circumstances, it is possible to lock up the whole system, but it happens considerably less frequently than in a DOS/Windows-based environment.)

A long installation

Both installing and using OS/2 2.1 requires time and commitment (at least initially). Getting up and running isn't simply a matter of copying a few disks. You should figure on at least half a day, and make a backup before you begin. There are many decisions to make along the way, too. The size of the installation task becomes apparent as soon as you rip open the shrink wrap. Buried under a couple of manuals is a pile of 25 3.5in disks. (A 5.25in version is available, too, with even more disks.) If you have a CD-ROM drive, IBM also offers a CD-ROM version. But in order to install OS/2 2.1 directly from the CD-ROM (and be able to access the CD-ROM drive later), you'll need to have a true SCSI CD-ROM connected to a specific SCSI controller made by Adaptec, Distributed Processing Technology, Future Domain or IBM. There are a lot of non-standard CD-ROM drives around with their own proprietary interfaces. IBM lets you use a nonstandard CD-ROM drive by first manually creating all 25 installation floppy disks (under DOS) from the files on the CD-ROM.

IBM says you'll need at least a 386SX and 4M of RAM. You'll definitely want more RAM and power, though, especially if you'll be taking advantage of OS/2's true multitasking capabilities. I found that a 486 (even an SX) and 8M of RAM is about the minimum to obtain acceptable performance. I finally settled on running OS/2 on a generic clone based on a 66MHz 486DX2 along with 16M of RAM. You'll need a hefty hard disk as well. A full OS/2 2.1 installation requires about 29M of disk space.

Take your choice

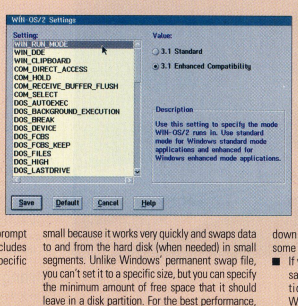
You can have the installation format your hard disk and start from scratch, choosing between the standard DOS FAT-based (file allocation table) file system or the HPFS (High Performance File System) unique to OS/2. HPFS offers some unique advantages, especially if you're using data-intensive applications such as databases. It is generally faster, although your mileage may vary, and it offers some neat extras, such as long (up to 255-character) filenames. However, HPFS and FAT files aren't compatible. For most users who are easing into the brave new world of OS/2, FAT will be sufficient.

If you decide to stay with FAT, you can use all the programs and data that are already on your hard disk. You can then also opt for the dual-boot feature that lets you boot either OS/2 2.1 or DOS at start-up. Being able to boot into your old familiar DOS environment is a comfort, but setting up your system for the dual boot is needlessly complex. To IBM's credit, the process is for the first time explained in plain English in the installation manual. But it

Tips for tweaking OS/2

For those used to twiddling with a few well-known commands in a DOS CONFIG.SYS or AUTOEXEC.BAT file, taking a look at the OS/2 versions can be daunting. They may have the same names as the DOS versions, but they're different beasts entirely. A 'typical' OS/2 CONFIG.SYS file consists of 60 or so lines with a raft of unfamiliar commmands such as THREADS MAXWAIT, and TIMESLICE.

What to do? Luckily, the OS/2 installation does a great job of setting all these esoteric commands to what's best for your system. But if you must tweak, help is right at your fingertips. For example, just typing HELP THREADS at an OS/2 prompt brings up detailed graphical help that includes everything you need to know and even specific (and always helpful) examples.



A couple of cautions

Caching — OS/2's built-in caching utility uses very little RAM for disk caching, 256K for an 8M system, and 512K for a 16M system. Although you might be tempted to increase that, it's best to leave it alone. OS/2 uses caching in a different and vastly more efficient way than does DOS. Your best bet is to leave the rest of the RAM for programs.

Swapping — OS/2's swap file is different from that of Windows. It's dynamic, expanding and contracting as needed, and usually stays comparatively small because it works very quickly and swaps data to and from the hard disk (when needed) in small segments. Unlike Windows' permanent swap file, you can't set it to a specific size, but you can specify the minimum amount of free space that it should leave in a disk partition. For the best performance, set the swap-file path for its own partition, although that requires some planning ahead.

Cleaning Windows

Win-OS/2, OS/2's version of Windows 3.1, is virtually identical to Microsoft's version. It should be; it has virtually the same source code. Win-OS/2 has its own WIN.INI and SYSTEM.INI files, and you're welcome to tweak away, just as you might under Windows 3.1.

The key to maximising Win-OS/2 performance is OS/2's unique settings screen, a menu of over 50 settings that can adjust just about any settings of Win-OS/2 that you can imagine (and many that you've never imagined). Best of all, you can set up different settings for different applications and different Win-OS/2 sessions. Each setting has its own detailed help available.

General tips

Because OS/2 is so capable doing lots of things at the same time, and because minimised program icons don't appear on the desktop, it's easy to lose track and end up with lots of concurrent programs dragging down system performance. What follows are some other helpful hints:

- If you're running a system with minimal RAM, say 4M, you should disable the default animation that's used to draw boxes in the Workplace Shell. Also, don't run multiple Windows sessions if you can help it. They absorb system resources like a software sponge.
- If you are running short on hard disk space, there are all sorts of OS/2 files you can live without. (For example, OS/2 comes with two different text editors.) The OS/2 manual does a great job of explaining every single file that's loaded during installaton, and it tells you what isn't essential for what you're doing. It's a great way for you to save megabytes.

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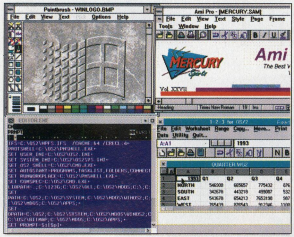
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Seamless Windows. OS/2 2.1 can run Windows, OS/2 and DOS applications concurrently. True pre-emptive multitasking means they're all running and not in a state of suspended animation

requires a number of steps, such as adding lines to your existing CONFIG.SYS and AUTOEXEC.BAT files and then copying all files from your root directory into your DOS directory. Why couldn't it include a batch file to automate the process?

The old disk shuffle

Installing OS/2 is not a linear process. You have to reinsert various disks at various times. It's also during the installation that some of OS/2 2.1's limitations begin to show up. To get seamless Windows (that is, the ability to run windowed OS/2, Windows, and DOS applications side by side) in something beyond 16-colour standard VGA. You need to have a graphics card based on chips by ATI, Cirrus Logic, Headland Logic, IBM, Trident, Tseng Labs or Western Digital. Or, you need to have OS/2-specific drivers from the graphics-card maker. These are becoming more common. For this review, I used a Radius XGA-2 board designed specifically for OS/2. I also tested beta drivers with a high-speed Matrox board and beta drivers for the Diamond Viper board. A fast graphics board and OS/2-tuned drivers can result in some impressive video performance.

The final step in the installation is 'migrating' both Windows and DOS applications to OS/2. The applications themselves aren't changed; essentially, folders and icons are created for the OS/2 desktop. Some common non-OS/2 applications require fine-tuning to run to best advantage in the OS/2 2.1 environment. OS/2 2.1 comes with a Migration Database that contains settings for many applications, taking advantage of the fact that each VDM (virtual DOS machine) in which a Windows or DOS application runs can have its own settings. (You can also migrate non-OS/2 applications later, or just install them directly from the OS/2 environment.) An IBM spokesperson says the company plans to update the migrations database regularly. It will be available on major BBSs and on CompuServe.

Exploring the workplace

When you finish installing OS/2 2.1, the moment of truth finally arrives: rebooting into the environment. What you see on the screen is vastly different from Windows' irritating-yet-familiar Program Manager. Initially, you can think of the Workplace Shell (WPS) as a cross between the Macintosh desktop and Norton Desktop for Windows. But it's much more than that. The WPS is almost infinitely customisable and can be clean or cluttered, depending on your work habits. You can have icons for applications and folders. And the WPS is hierarchical, too; you can have folders within folders ad infinitum. Unique to the WPS is its ability to shadow icons — to create multiple icons for the same application that can reside in multiple locations on the desktop (for example, in multiple folders).

The WPS is also object-oriented with a vengeance. You've heard that before, but this is the real thing. Icons, folders, and even the blank space on the WPS are all true objects. You can drag and drop to your heart's content. And you'll need to exercise that long-neglected right mouse button. When you point to any object on the screen and click the right-hand button, up pops a list of common tasks associated with that object. It makes a great deal of sense, but it also takes getting used to.

Virtual DOS reality

If you are a creature of confirmed Windows habits, you can click on the Win-OS/2 Full Screen icon and work away in 3.1 Program Manager while completely ignoring OS/2. That's fine, but the real edge of OS/2 2.1 is in its true multitasking capabilities. From within the WPS, you can click on any application icon — Windows, DOS or OS/2 — and OS/2 starts it up. It's possible to have multiple Windows, DOS and OS/2 sessions all running concurrently. In fact, that's the major advantage of OS/2.

The ability to have multiple Win-OS/2 sessions running concurrently isn't hard to see. You can, for example, have Procomm Plus doing a high-speed file transfer in one Windows session while Excel is doing some heavy calculations in another. They don't get in each other's way. And while all this is going on, you can also be formatting a floppy disk under OS/2 and perhaps running a dBASE under DOS. Admittedly, the system I used for this review is powerful, but I didn't begin to see any degradation of perfomance until I had six major applications running concurrently.

For those of us who occasionally still run

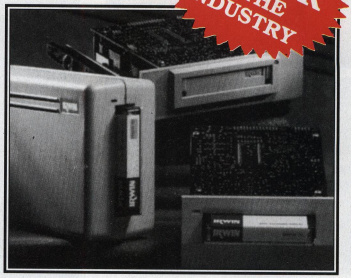
ADVANTAGES	DISADVANTAGES
■ Multitasking: True pre-emptive multitasking walls off applications from each other.	■ No 32-bit Windows support: OS/2 is a 32-bit operating system, but it won't run 32-bit Windows applications and Windows VxDs (virtual device drivers). IBM says a solution is on the way.
■ Workplace shell: This truly object-oriented graphical interface is like a cross between the Mac and Norton Desktop for Windows.	■ Missing drivers: Version 2.1 has more built-in drivers (for example, CD-ROM, SCSI and graphics) than ever before. But you still can't be sure that your peripherals will work to best advantage with OS/2. And some peripheral makers have no plans to make drivers available.
■ Windows anywhere (or DOS or OS/2): Start any application from anywhere in Windows, DOS or OS/2.	■ Workplace shell: Even though this also appears under Advantages, it can be needlessly complicated to figure out how to use the GUI. Common operations are sometimes buried deep in confusing layers of object orientation. Plus it's too easy to lose track of what's where and what's running.
■ Capable Interapplication Communication: Clipboard and DDE work between all Windows and OS/2 applications.	■ Wimpy applications: The Productivity Applications included with 2.1 are a misnomer. Wipe them off the disk and get real applications.
■ Online help: Just about everything you need to know is a couple of mouse-clicks away.	■ Dual-boot setup: It works well, letting you switch back to your original DOS-based system. But setting it up is a needlessly complicated manual process.
■ Advanced multimedia: True multitasking makes multimedia easy and powerful, supporting IBM's Ultimedia. OS/2 2.1 supports Sound Blaster and Media Vision sound cards and plays digital video at up to 30 frames per second in up to 320 by 420-pixel resolution. The CD-ROM version of 2.1 includes a considerable collection of sound and video files.	

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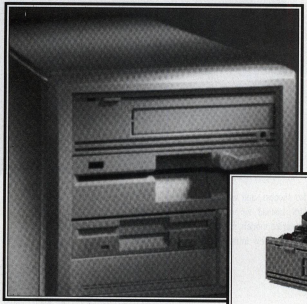
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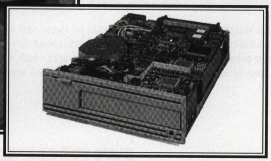
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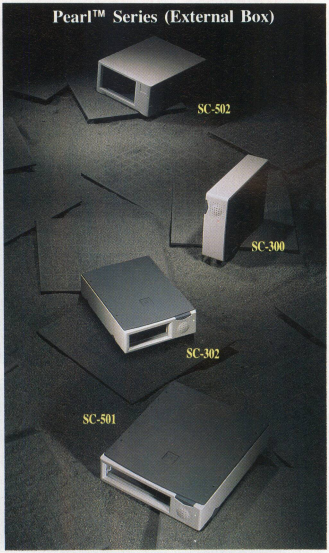
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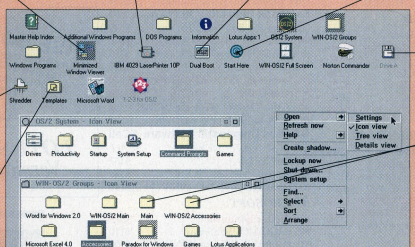
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A guide to the Workplace Shell

The Workplace Shell is aggressively object oriented. Point anywhere, even on a blank area (as shown), and click on the right-hand mouse button; up pops a menu of associated choices. Shaded icons mean an application (or application in the group) is running in the background.



old favourite DOS applications, OS/2 is particularly powerful. You can run sections of separate VDM sessions. And each can have separate CONFIG.SYS and AUTOEXEC.BAT files, as well as numerous other customised settings. The same holds true of Win-OS/2 sessions. (See the box, 'Tips for Tweaking OS/2'.)

VDMs aren't perfect. They don't, for example, let you run block device drivers such as those used by my Bernoulli PC-Powered MultiDisk 150, which uses a proprietary SCSI interface that isn't supported under OS/2. In addition, I couldn't run the drivers for the LANtastic 5.0 network operating system. There is, however, a way to get around the problem, at least partially. You can boot a 'true' DOS image and use drivers that aren't supported under OS/2's VDMs. The process is comparatively complex. You first create a bootable DOS disk on another computer, then copy FSFILTER (a DOS device driver that provides access to OS/2 partitions) to it, use VMDISK to create an image of a disk on your OS/2 hard drive, and finally create a new object for the DOS session. It works, but you get access only to the devices from within the DOS session under OS/2.

The 32-bit question

The future of true 32-bit applications for the OS/2 environment is a mixed one. Although OS/2 applications are becoming more prevalent, few yet take advantage of the OS/2 internal power and multithreading capabilities. Some (for example, WordPerfect for OS/2) are 16-bit ports of Windows applications. But true 32-bit applications (such as Lotus Ami Pro for OS/2) are now appearing. Their performance is impressive when compared with Windows.

More thorny is the question of the future of 32-bit applications under Win-OS/2. When I wrote this, Win-OS/2 didn't support Windows 32-bit applications and VxDs (virtual device drivers). At the present time, most applications are compatible under OS/2 2.1. And because Windows for Workgroups uses VxDs, you can't use it with OS/2. Help should be on the way; IBM expects that an OS/2 2.1 upgrade will appear "by the end of the year" at the earliest to handle this. And, as mentioned, the question of longer-term OS/2 compatibility with future versions of Windows remain up in the air.

Let's get real. OS/2 2.1 isn't going to push aside Windows. Windows has too large an installed base. But neither will Windows destroy OS/2 2.1. OS/2 has some tantalising advantages that make it ideal for true PC power users, especially in the corporate environments that IBM knows and loves. After years of development and testing, and six versions, IBM should finally take a few well-deserved bows for OS/2 2.1. For PC users who need true pre-emptive multitasking, OS/2 makes a solid choice.

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For both installing occasionally needed drivers and troubleshooting new ones, this utility can be a real time-saver.

BY RICK KNOBLAUGH

Load device drivers from the DOS prompt with DRVLOAD

Device drivers provide DOS with a convenient way to support a wide variety of peripheral devices. But having to edit your CONFIG.SYS file and reboot in order to add the device= statement needed by a peripheral you don't use regularly — a CD-ROM drive or a RAM disk, for example — is anything but convenient.

DRVLOAD, this issue's free utility, eliminates that nuisance. With DRVLOAD you can load an unexpectedly needed device driver right from the DOS command prompt. Not even the multiple configuration setups provided by DOS 6.0 give you that kind of instant flexibility. And DRVLOAD works with versions of DOS from 3.0 onward.

You can get a copy of DRVLOAD from MagDisk, just complete and send the coupon on page196, along with a cheque to cover postage and handling. You'll need a Microsoft MASM assembler and the LINK and EXE2BIN utilities to work with the source code.

Using DRVLOAD

To load a driver with DRVLOAD, simply enter the command, followed by the full device driver filename and any required driver parameters. The complete command syntax is

```
[LH] DRVLOAD [d:][path]filename
     [driver_parameters]
```

For example, to install ANSI.SYS from your DOS directory on drive C:, you'd simply enter

```
DRVLOAD C:\DOS\ANSI.SYS
```

Or, to add a 32K RAM disk to the same location to speed up some sluggish disk-intensive operations, enter

```
DRVLOAD C:\DOS\RAMDRIVE.SYS 32
```

In addition to eliminating the need to edit and reboot when adding a new driver, DRVLOAD also makes it possible to load drivers conditionally, based upon user input or other considerations embedded in a batch file. And if you write device drivers, you know the difficulty associated with debugging them: Their initialisation code is executed before you even get a chance to load your debugger. Since DRVLOAD simulates what DOS does at boot time, it is a handy tool for troubleshooting many such driver initialisation problems.

To save memory when loading drivers, you can execute DRVLOAD using the DOS 5.0 (and later) LH or LOADHIGH command. This will install the driver in the upper memory blocks (UMBs); that is, in the extended memory mapped within the top 384K address space of the first megabyte of RAM. The driver will then be loaded just as it would be if DEVICEHIGH were specified in CONFIG.SYS. This reduces the amount of base memory consumed by resident programs such as device drivers.

There is one potential danger to loading device drivers in upper memory blocks, however. A driver loaded in a UMB has a limited amount of RAM available, especially when other programs are already loaded there. DRVLOAD itself tells the driver how much memory is available, but some drivers ignore this information and simply assume they can use as much memory as they need. DRVLOAD attempts to handle this situation by checking the size of the driver file and reporting an error if this size exceeds available memory.

This precaution, though usually sufficient, is not entirely foolproof, since drivers may claim additional memory for buffer space or other work areas. If you experience difficulty when trying to use LOADHIGH with DRVLOAD, you may wish to load the driver without the LH parameter and then scan the output of the DOS 5 MEM/C command, looking for all the blocks of memory

Device driver header

Field	Size	Offset
Link to next driver	dword	0
Attribute	word	4
Offset of strategy	word	6
Offset of interrupt	word	8
Device name (character drivers)	8 bytes	0ah
Number of units (block drivers)	1 byte	0ah
Also, for a DC-ROM device:		
Reserved (must be 0)	word	12h
Drive letter	byte	14h
Number of units	byte	15h
Signature ("MSCDnn")	6 bytes	16h

***Fig 1:** MS-DOS device driver headers conform to this format*

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belonging to the particular driver. Better yet, the MEM/M *drvname* command in DOS 6.0 will show you all the blocks used by a particular driver. (For *drvname*, you use the name portion of the driver only, without extension.) After learning how much space the driver needs, the simple MEM report of DOS 5.0 or 6.0 will determine whether there's room to load the driver in upper memory.

Since DRVLOAD is executed from the DOS prompt, you should not use it to install drivers that must be present as part of the boot process. For example, EMM386 and HIMEM, which are needed during booting to load DOS high, should not be executed with DRVLOAD.

Why no uninstall?

You might think that one good reason for loading device drivers from the DOS prompt instead of through CONFIG.SYS would be to let you uninstall them later. Unfortunately, however, device drivers don't lend themselves to such treatment.

Like TSR programs, device drivers typically install interrupt handlers for communicating with hardware devices. But while utilities such as MARK/RELEASE and INSTALL/REMOVE can restore the original interrupt vector contents and deallocate the memory used by resident programs without crashing the system, DRVLOAD alters a number of internal DOS data areas in the course of creating an appropriate context for the device drivers it loads. To restore not only the interrupts, but the whole previous context when a driver was uninstalled would be a complex task — a task that would become even more complex as subsequent drivers were added via DRVLOAD.

Because of similar considerations, you cannot use DRVLOAD in a Windows DOS box. When you exit the DOS box, Windows automatically undoes any changes a program has made to the hardware interrupts, but since Windows does not expect the kind of low-level DOS data structure manipulation performed by DRVLOAD, using the utility in a DOS box could spell trouble. DRVLOAD simply refuses to execute under Windows.

In the end, then, I judged that the convenience of being able to uninstall (at best) the device driver last loaded by DRVLOAD was not worth the risk of making the utility crash-prone. I have not provided a means of uninstalling device drivers within DRVLOAD, therefore, nor should you ever use INSTALL/REMOVE or any other TSR-uninstalling utilities in conjunction with the DRVLOAD utility. (MARK/RELEASE is apparently smart enough to detect that it shouldn't try to unload a device driver, but many other such utilities are not.)

Other caveats

If, when installing a device driver with DRVLOAD, you get an error message that there aren't enough drive letters available, it simply means that one line in CONFIG.SYS will have to be changed.

By default, DOS accommodates as many block devices as there are *actual* drives on the system, with a minimum of five, which are referenced as drives A: through E:. More drives can be added by putting an appropriate LASTDRIVE= statement in CONFIG.SYS. For example, if your system has five or fewer actual drives, LASTDRIVE=G (note that the usual drive-denoting colon is not used in this statement) would make room for two additional block devices, drives F: and G:. You will have to reboot when you've added or changed the LASTDRIVE statement, of course, but thereafter you'll be able to use DRVLOAD to load block devices from the command line without incident.

Inside DRVLOAD

Having seen how to use DRVLOAD, you may wish to examine some of its inner workings. Since DRVLOAD must mimic the processing that DOS performs when initialising a device driver, a review of MS-DOS device driver architecture may provide a helpful starting point.

MS-DOS device drivers come in two flavours: character and block. Character device drivers control peripherals such as modems, keyboards and printers, which handle I/O 1-byte (character) at a time. These devices are referenced within the system by device names such as COM1, CON and PRN, and they can be treated in some respects as if they were *files*, as in the command **COPY FOO PRN.** Block device drivers control such devices as floppy and hard disks, which perform I/O operations on whole chunks (that is, sectors) of data at once.

Block devices are referenced by drive letters, such as A: or C:. For further information about MS-DOS device drivers, I recommend Robert S. Lai and The Waite Group's *Writing MS-DOS Device Drivers* (Addison-Wesley; $50.95). Another useful source is Ray Duncan's *Advanced MS-DOS* (Microsoft Press; $58.95).

The format for the first portion, or header, of a DOS device driver is shown in Figure 1. The header tells DOS both the type of device being controlled and the location within the

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The command request block

Field	Size	Offset
Value passed to driver:		
Command code (0 for INIT)	byte	2
End of available driver memory (DOS 5+)	dword	0eh
Pointer to command line (first character after "device=")	dword	12h
First available drive number (DOS 3+)	byte	16h
Values returned by driver:		
Return status	word	3
Number of units (block drives only)	byte	0dh
End of resident code (driver break address)	dword	0eh
Pointer to BPB pointer array (block drivers only)	dword	12h
Message flag (DOS 5+) (indicates if DOS should display message in INIT fails)	word	17h

***Fig 2:** The table above shows the values passed to and received from the device driver via the initialization command request block*

driver of the strategy and interrupt routines. The former is specified by bits in the attribute field. The latter are the routines that DOS calls when it sends commands to the driver. Further header information includes either the device name (for character devices), or the number of units (drives) supported (for block devices).

DOS performs two steps when it sends commands to device drivers. First it sets the ES:BX register pair to point to a command request block and calls the device driver strategy routine. This portion of the driver simply stores the ES:BX pointer and returns. Then DOS calls the driver's interrupt routine, which retrieves the saved command request block pointer and processes the command.

Figure 2 shows the layout for the INIT command, which is the first command sent to a device driver. Several values within the INIT command block are filled in by the interrupt routine. The break address field indicates the last memory location within the driver that is to be retained in memory after initialisation. For block devices, the BPB (BIOS Parameter Block) field points to a table that contains offsets to the BPB for each unit supported by the device driver. BPBs let DOS know about the important aspects of the disk; for example, the sector size, total number of sectors, number of root directory entries, and so on.

Given this information, the tasks of DRVLOAD seem clear: read the driver into memory, send it an INIT command, calculate the amount of memory used by the driver (returned in the break address), let DOS know there's a new driver on the system, and make the driver area terminate and stay resident. Each of these areas deserves further comment.

Loading and locating

When DOS loads a .COM program, it allocates all available memory to that program. A field in the Program Segment Prefix (PSP)

do_drv_init — **Complete listing**

```
;-----------------------------------------------------------
;do_drv_init - Format an INIT cmd blk and call the driver  |
;             strategy and interrupt routines.             |
;                                                          |
;          Enter:                                          |
;                  ds=local data segment                   |
;                es:bx=ptr to driver header                |
;          driver_p_off=offset of any cmd line parms       |
;                  (these are preceded by driver           |
;                   file name in driver_file)              |
;                al=number of block devices on system      |
;                                                          |
;          Exit:                                           |
;                  ax=number of paragraphs to keep         |
;                es:bx=ptr to driver header                |
;                  NZ=if INIT failed.                      |
;                                                          |
;    ds saved                                              |
;-----------------------------------------------------------
do_drv_init     proc    near
                push    ds
                push    es                      ;save driver header ptr
                push    bx
                mov     si, bx                  ;offset of driver
                mov     bx, driver_p_off
                mov     byte ptr [bx - 1], ' '  ;file spec was ASCIIZ
                mov     dx, offset driver_file  ;offset of cmd line
                mov     bx, offset init_cmd_blk ;point to cmd block
                mov     [bx].rh_len, (size init_req) ;len cmd blk
                mov     [bx].init_bpb_tbo, dx   ;offset cmd line
                mov     [bx].init_drv_first, al ;next available drive
                mov     [bx].init_bpb_tbs, cs   ;seg for cmd line
                mov     [bx].init_brk_seg, cs   ;end of avail mem

                mov     ax, ds
                mov     dx, es
                assume  ds:nothing
                mov     ds, dx                  ;ds=driver header
                mov     es, ax                  ;es=local data

;es:bx point to driver cmd request block
                push    cs                      ;far
                mov     ax, offset do_drv_i1@@  ;return address
                push    ax

                push    ds                      ;far "call"
                push    word ptr [si].dev_stratr ;address

                retf                            ;make strategy call

do_drv_i1@@:
                push    cs                      ;far
                mov     ax, offset do_drv_i2@@  ;return address
                push    ax

                push    ds                      ;far "call"
                push    word ptr [si].dev_intr  ;address
                retf                            ;make int call

do_drv_i2@@:
                test    es:[bx].rh_status, (mask err_bit) ;error?
                jnz     do_drv_i9@@
                mov     dx, ds                  ;start of driver
                mov     ax, es:[bx].init_brk_seg
                sub     ax, dx                  ;difference if any
                mov     dx, es:[bx].init_brk_ofs
                add     dx, 0fh                 ;paragraph round
                mov     cl, 4
                shr     dx, cl                  ;convert to paragraphs
                add     ax, dx                  ;total paragraphs
                sub     cl, cl                  ;zero flag set
                assume  ds:code

do_drv_i9@@:
                pop     bx
                pop     es                      ;driver header seg
                pop     ds
                ret
do_drv_init     endp
```

***Fig 3:** The routine above is used to issue the initialisation command to a device driver*

make_drives **Complete Listing**

```
;-------------------------------------------------------------
;make_drives - Create the DPB entries and fill in CDS entries
;             for each unit supported by the device driver.
;             Also, update number of block devices field in
;             the DOS list of lists.
;
;          Enter:
;                 ds=local data segment
;             cds_ptr=ptr to next available CDS entry
;            cds_size=size of each CDS entry
;             dpb_ptr=ptr to first DPB entry
;            dpb_size=size of each DPB entry
;          last_drive=max number of CDS entries
;                 es:bx=ptr to driver header
;        dpb_link_off=offset of link to next device driver
;         dpb_drv_off=offset of address of device driver
;                     in DPB entry
;      max_avail_units=maximun number of drive letters
;                      available for drives
;          Exit:
;                 CY=set if for some reason, DOS data
;                    areas corrupted, etc. (this should
;                    never happen)
;
;        mem_to_keep=adjusted to add in DPBs placed
;                    at end of driver (break address)
;
;
;    ds, es, bx preserved
;-------------------------------------------------------------
make_drives     proc    near
                push    bx
                push    ds
                push    es
;
;dpb_size contains DOS version specific size of DPB entry.  Convert
;this to paragraphs -used to determine the number of additional
;paragraphs we need to keep resident.
;
;
                mov     ax, dpb_size            ;size each DPB
                add     ax, 8fh                 ;round up
                mov     cl, 4
                shr     ax, cl
                mov     dpb_para, ax

                sub     ch, ch
                mov     cl, es:[bx].dev_num_units   ;number of units
                cmp     cl, max_avail_units     ;enough drive letters?
                jbe     make_dr85#
                mov     ah, 9
                mov     dx, offset units_msg    ;let user know that
                int     21h                     ;we can't do all of them
                mov     cl, max_avail_units     ;only do what we can

make_dr85#:
                call    get_last_dpb            ;find last DPB
                jc      make_dr999              ;exit if error
;
;dx:si holds ptr to DPB for previous drive.  Save the pointer.
;
                mov     prev_dpb_ptr.d_segment, dx
                mov     prev_dpb_ptr.d_offset, si

;
;Save device driver header address
;
                mov     cs:drv_head_offset, bx  ;save drv header
                mov     dx, es

;get pointer to BPB table

                lds     bx, dword ptr cs:init_cmd_blk.init_bpb_tbo

                mov     al, cs:init_cmd_blk.init_drv_first ;drive
                sub     ah, ah                  ;unit counter

make_dr18#:
                push    ax                      ;save unit count/drive #
                mov     ax, dx                  ;base of driver
                add     ax, cs:mem_to_keep      ;set for DPB
                mov     es, ax

;
;Clear the area where DPB will reside.  BPB to DPB function doesn't
;initialize all of the fields.  This ensures that the drive access
;field is clear initially.
;
;
                push    cx                      ;save unit count
                mov     cx, cs:dpb_size         ;clear the DPB area
                xor     al, al
                xor     di, di
                rep     stosb
                pop     cx

                xor     bp, bp                  ;es:bp ptr to new DPB
                mov     si, [bx]                ;get BPB offset
;
;Use undocumented DOS call to translate BPB to DPB
;
                mov     ah, DOS_XLAT_BPB
                int     21h
                xor     di, di
                pop     ax                      ;count/drive #
                push    ax                      ;save again
                mov     es:[di], ax             ;put into DPB
;
;Put address of device driver into DPB.  Offset for this DPB entry
;is DOS version specific.
;
                push    bx
                mov     bx, cs:dpb_drv_off
                mov     es:[di + bx].d_segment, dx ;device driver

                mov     ax, cs:drv_head_offset
                mov     es:[di + bx].d_offset, ax

                mov     bx, cs:dpb_link_off
                mov     bp, bx                  ;save link offset

;
;Link to next DPB
;
                mov     ax, 0ffffh              ;mark this as last DPB

                mov     es:[di + bx].d_segment, ax
                mov     es:[di + bx].d_offset, ax

                pop     bx

                inc     bx                      ;next BPB table entry
                inc     bx

                call    fill_cds

;Link previous DPB to this one
;
                mov     ax, es                  ;DPB segment
                mov     si, di                  ;DPB offset

                les     di, cs:prev_dpb_ptr     ;previous DPB
                add     di, bp                  ;link offset in DPB

                mov     es:[di].d_segment, ax
                mov     es:[di].d_offset, si

;
;Save pointer to DPB just created (in case more than one unit
;is supported, it can be linked to the next DPB created).
;
                mov     cs:prev_dpb_ptr.d_segment, ax
                mov     cs:prev_dpb_ptr.d_offset, si

                mov     ax, cs:dpb_para         ;# paragraphs DPB uses
                add     cs:mem_to_keep, ax      ;add to total to keep

                pop     ax                      ;save unit count/drive #
                inc     ah                      ;unit counter
                inc     al                      ;drive counter

                loop    make_dr18#

                push    ax                      ;save unit count
                mov     ah, DOS_LIST_LISTS
                int     21h                     ;get list of lists ptr
                pop     ax                      ;restore it
;
;Increase the number of block devices variable kept in the DOS
;list of lists.
;
                mov     si, cs:num_blk_off      ;offset for # drives
                mov     al, cs:num_blk_devices  ;original number
                add     al, ah
                mov     es:[bx + si], al

                clc                             ;success
make_dr999:

                pop     es
                pop     ds
                pop     bx
                ret
make_drives     endp
```

Fig 4: *The code above supports altering system areas in order to add block devices*

QUICK REFERENCE GUIDE

DRVLOAD

Rick Knoblaugh

Purpose: Installs MS-DOS device drivers from the DOS command prompt, eliminating the need to edit the CONFIG.SYS file to include device= statements and then reboot.

Format: [LH] DRVLOAD [*d*:][*path*]*filename* [*driver_parameters*]

Remarks: The DRVLOAD utility can be executed directly from the command prompt of DOS 3.0 or later; it cannot be run from the DOS box of Windows, however. The utility requires approximately 2K of storage space, and it adds approximately 256 bytes to the size requirement of the drivers it loads.

When executed under DOS 5.0 or later, preceding DRVLOAD with the LH (LOAD-HIGH) command causes the utility to be loaded into upper memory blocks, thus saving space in conventional memory. If insufficient UMB memory is available for the driver file size, DRVLOAD reports the error. Drivers that claim additional memory when loaded, however, may fail to load properly with LH if their memory demand exceeds that available. Loading the driver in conventional memory and using the MEM /C (DOS 5) or MEM /M (DOS 6) commands will indicate the actual driver requirement.

Although intended primarily for occasionally loading infrequently used drivers (such as for RAM disks or CD-ROMs), DRVLOAD can be used as part of a batch file to load drivers conditionally. It is also useful in debugging, where conventional loading would execute the driver code before a debugger could be loaded.

DRVLOAD cannot be used to install those drivers (such as EMM386 and HIMEM) that must be present during the boot process. Further, no attempt should be made to use utilities such as MARK/RELEASE or INSTALL/REMOVE to uninstall drivers loaded with DRVLOAD.

Both the executable FINDIRQ.COM and its assembly-language source files can be obtained through MagDisk. A Microsoft MASM assembler (or compatible), LINK and EXE2BIN are required if the program must be reassembled.

identifies the end of the memory block allocated to the program, which is thus the top of available memory. To preserve the maximum amount of free contiguous memory, before it loads the specified device driver, DRVLOAD relocates the loader portion of its own code just below this point. At the same time, DRVLOAD discards the portions of its own code (the code used for parsing the command line, verifying DOS version, and so on) that are no longer needed.

Next, DOS function 430Bh (load overlay) is used to retrieve the specified device driver from disk and to load it just after DRVLOAD's original PSP area. The load overlay function is used instead of reading the file into memory because some device drivers are in .EXE formats and the load overlay function resolves all .EXE header items. (For more information on the PSP and .EXE formats, see The *MS-DOS Programmer's Reference: Version 5.0*, Microsoft Press, $45.)

After performing a little sanity checking on the device driver header (the user may have specified a nondevice driver filename on the DRVLOAD command line, for example), DRVLOAD formats an INIT command request block and calls the device driver strategy and interrupt routines. The code for this process is listed in Figure 3.

If the INIT command fails, the status field in the command request block is returned with the high bit set, indicating an error. In that case, DRVLOAD displays an error message and exits to DOS. If initialisation is successful, DRVLOAD must patch the device driver into the DOS device driver chain. Therefore a pointer to this chain is retrieved, using the undocumented DOS 'list-of-lists' function, 52h. Part of the information returned by this function is a pointer to the NUL device driver header, which marks the beginning of the driver chain. (DRVLOAD also saves several other items that are returned from this function and that will become important later.)

Like DOS, DRVLOAD adds new device drivers to the driver chain by inserting them in the chain just after the NUL device. That is, the driver chain link address in the NUL device header is replaced with the address of the driver being installed, and the link field in the driver's header is then updated with the original contents of the NUL device header's link field.

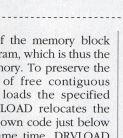
Character and block devices

Once the driver has been loaded and linked into the DOS chain, the next step depends on the type of driver being installed.

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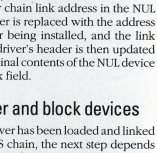
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The current directory structure

Field	Size	DOS 3 Offset	DOS 4+ Offset
ASCIIZ string of current path	76 bytes	0	0
Bit flags	word	43h	43h
Pointer to DPB	dword	45h	45h
First cluster of current working directory (nonnetwork)	word	49h	49h
Pointer to a redirector record (network)	dword	49h	49h
Unkown (always Offffffffh) (nonnetwork)	dword	4bh	4bh
Stored parametre from INT 21 AX=5F03h (network)	word	4dh	4dh
Offset of '/' in current path for root directory	word	4fh	4fh
Unknown	byte	N/A	51h
Pointer to IFS driver	dword	N/A	52h
Unkown	word	N/A	56h

***Fig 5:** DRVLOAD creates a DPB entry with this structure for each drive unit controlled by the device driver. (The field descriptions are from Andrew Schulman's Undocumented DOS.)*

DRVLOAD calculates the size of the device driver in paragraphs and stores this information in the variable **mem_ to_ keep.** For character device drivers, it then passes the size to the DOS TSR (terminate and stay resident) function, 31h. Since the driver is loaded at the beginning of the memory allocated to DRVLOAD, this effectively terminates the utility and leaves the driver resident. For block device drivers, there's more work to be done, since DOS must be convinced that another drive is present on the system. To accomplish this, DRVLOAD must again call upon undocumented DOS features, this time to manipulate the DPBs (Drive Parameter Blocks) and CDSs (Current Directory Structures). The code that performs these tasks is listed in Figure 4.

DOS maintains a DPB entry for each physical drive on the system. As shown in Figure 5, this entry houses not only the BIOS Parameter Block data, but also other information, including the address of the device driver responsible for controlling the drive. DRVLOAD must create a DPB entry for each drive unit handled by the device driver.

Creating the DPB entry requires several steps. First, using a pointer to the DPB chain (retrieved from the 'list-of-lists' function), DRVLOAD locates the end of the chain and adds a new DPB to it. To generate the DPB information for the entry, DRVLOAD then uses the undocumented DOS function 53h: Translate BPB to DPB. DRVLOAD calls this function for each unit controlled by the device driver.

A pointer to each unit's BPB (gained from the pointer to the table returned in the INIT call) and a pointer to a data area to be filled with the DPB information are passed to the translate function. DRVLOAD positions each DPB in memory just after the end of the code used by the device driver (its 'break address'). The number of memory paragraphs used by each DBP is added to the variable **mem_to_keep,** which specifies how much memory will remain resident.

Care must be taken when using the Translate BPB to DPB function. Since it is used internally by DOS, the function includes no error-checking precautions against being passed invalid BPB information, such as zeros for the number of sectors or sectors per cluster fields. Although drivers should normally never generate incorrect BPB data, DRVLOAD inspects these values prior to calling the function, thus avoiding a potential system hangup.

With the DPB entries created, the next step is to fill in the CDS entry for each drive. As its name implies, the Current Directory Structure contains the current directory on the drive. In addition, it has a status bit flags field that indicates whether the drive is a network or physical drive, or whether it is a logical drive that results from a JOIN or SUBST command. (The CDS is where SUBST and JOIN actually do their work.) These fields also indicate whether the drive is an Installable File System (both set) or an invalid drive (neither set). The format of the CDS is shown in Figure 6. Since each CDS entry's current working directory string is prefilled by DOS with the root directory for that drive, DRVLOAD simply initialises the other fields, including the pointer to the DPB.

The last step in making DOS aware of the existence of the added drive(s) is to update the 'list-of-lists' field that contains the number of block devices. DRVLOAD adds the number of units supported by the device driver to the previous value. This completes the additional installation processing required for block device drivers.

Next time you wish you'd loaded a given device driver, don't even think about editing CONFIG.SYS and rebooting. Instead, install it from the DOS prompt without all that hassle, using DRVLOAD.

The driver parameter block

Field	Size	DOS 3 Offset	DOS 4+ Offset
Driver Number (A = 0)	byte	0	0
Unit number within driver	byte	1	1
Sector size	word	2	2
Sectors per cluster - 1	byte	4	4
Sectors/cluster in log base 2	byte	5	5
Number of reserved (boot) sectors	word	6	6
Number of copies of FAT	byte	8	8
Number of root directory entries	word	9	9
First data sector	word	0bh	0bh
Number of clusters +1	word	0dh	0dh
Number of FAT sectors	byte	0fh	N/A
Number of FAT sectors (DOS 4+)	word	N/A	0fh
First sector root directory	word	10h	11h
Address of device driver	dword	12h	13h
Media descriptor	byte	16h	17h
Indicates access to drive — a value of 00 means block accessed — a value of 0FFh means block must be rebuilt	byte	17h	18h
Address to next DPB	dword	18h	19h
Cluster at which to start ; search for free space when writing	word	1ch	1dh
Number of free clusters	word	1eh	1fh

***Fig 6:** DRVLOAD fills in the Current Directory Structure for each new drive created*

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Peripherals

Maximising your images

I'm having a problem with the display on my new computer. When I run Windows, I adjust the image so it fills most of the screen. When I switch back to DOS, however, the image is off the top, right-hand side, and I have to readjust the picture. The company's technical support department told me this was normal and instructed me to set the image to a smaller size so it still fits on the screen when I switch back to DOS. This solution will certainly solve the problem, but it seems like a waste of screen space. Do you think there is something wrong with the system?

David Mabaffy

Australian Personal Computer RESPONSE

It's possible that this is normal for your monitor and display card combination, but there are some other things you can try before giving up on the display real estate.

The problem stems from the fact that the monitor is trying to synchronise the different signals being produced by the video adaptor card. Despite what you might expect, there are wide variations in timing among the signals produced by various cards. There are also wide variations among the kinds of signals that different monitors are set up to receive.

With more expensive monitors (especially those that have digital controls), there are ways to configure the monitor so it stores the image size and position settings for various signals. Based on what you describe, however, it sounds as if the monitor has analogue controls, and consequently there is no way for you to store the picture settings. Instead, the picture settings are set at the factory in anticipation of receiving signals with particular timings.

If this is the case, you may be able to solve the image-size problems by using a different Windows video driver. Try to configure the video adaptor for other resolutions, colour depths and refresh rates. Some video cards also have separate utilities that configure the board's signals for various monitor models; try different monitor settings to see if one works better than the others.

If neither of these suggestions solves the problem, you are left with two choices: you can either live with the smaller image onscreen or replace your video card or monitor with one that's a better match for the remaining component.

Alfred Poor

Faster displays improve your flight

Flight simulators and air combat games can be a lot of fun, but the jerkiness of the screen image causes problems. In some cases, the frame rate is so slow that the game is unplayable. What can I do to speed up the image?

Ryan Hoffman

Australian Personal Computer RESPONSE

The flight simulation enthusiast's eternal quest is for a faster frame rate. Unfortunately, this is matched by a desire for detailed scenery and more realistic 3D objects, which tend to slow down displays considerably. But there are some things you can do to shift the scales in favour of faster displays.

First and foremost, many programs have configuration options that you can set to decrease the level of complexity in the displayed image. Turn off ground texture and shading as much as possible. Eliminate any extraneous objects (like other planes) if they are not critical to the game experience.

Check the availability of special drivers

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for your video card, or think about purchasing a card that has drivers included. For example, there are special drivers under development for some of the ATI cards that can be used with Microsoft Flight Simulator. (You can download beta versions of the drivers from CompuServe's Flight Simulator forum (GO FSFORUM).)

If you're buying a new system, consider purchasing one with a local-bus video feature. Many users are reporting that they achieve significantly faster frame rates for their flight simulators when running a VL-Bus motherboard and video adaptor.

Surprisingly, a maths coprocessor rarely has an impact on display speed. Many programs rely on integer maths for their calculations, and support for a floating-point coprocessor wouldn't have a major impact on performance. However, there are a few programs that can take advantage of a coprocessor, so it pays to check your program requirements.

Alfred Poor

Word processing

Printing check boxes in WordPerfect

If you're preparing a list or form in WordPerfect and you need check boxes, you can use the box that you get with the compose character 4,38 (entered with Ctrl-V, 4, 38, Enter). However, the character is somewhat small for a check box, and it hangs above the line. Getting the check box properly sized and lined up with the rest of the text can be a challenge.

You can meet the challenge with this simple macro — assuming only that your printer can vary type size:

```
{DISPLAY OFF}{Format}oad.025
  {Enter}00
{Font}sv{^V}4,38{Enter}{Right}
{Format}oau.025{Enter}00
```

The first line uses the Advance Down command to move the printing position down by 0.025in. The second line sets the font size to Very Large, enters the box character, and moves the cursor one character to the right, so it's beyond the code that turns Very Large size off. The third line uses the Advance Up command to return the printing position to the proper place for the line. You can enter this entire macro by recording it. Use Shift-F8 to enter the {Format} command, Ctrl-F8 for the {Font} command, the Enter key for {Enter}, and the Right Arrow key for {Right}.

Larry Christenson

Some might argue that the compose box character 4,38 is just fine for a check box as is. However, it's a little small to be useful at point sizes of 12 and below, serving better as a fancy bullet than a check box. The above macro provides a simple way to make the box large enough to be useful with smaller text, without making it unreasonably large with larger text.

There are one or two variations you might want to try on the macro as shown. If you use this macro to create a check box with text in various fonts and point sizes, you'll find that the relative size and position of the box in relation to the text varies with font and point size. It will also vary somewhat depending on your printer.

With my Canon printer, for example, using 12-point (10-cpi) Courier, the box is noticeably taller than it is wide, and noticeably taller than the text. Using 12-point Dutch (the equivalent of Times Roman), however, the box is square and only a little taller than the text. With compose character 5,24 rather than 4,38, the resulting box is closer to square in all cases.

You may also want to experiment with positioning. Based on tests with several fonts in sizes from 12 to 20 points, the 0.025in shift up and down is a good compromise with compose character 4,38 for all fonts, but the positioning clearly varies, so that in some cases the text is vertically centred on the box, while in others the bottom of the text is almost on a line with the bottom of the box. Much the same is true for compose character 5,24, except that 0.05 inches is a better overall compromise for my printer.

If you use check boxes extensively in your forms and you use widely varying fonts and sizes, you may even want to create slightly different macros with custom positioning for different fonts and sizes. And, finally, as a minor aesthetic consideration, you might want to change the 00 at the end of the first and third lines with {Exit}, entered by pressing F7.

Note that for the macro to work — in any variation — WordPerfect not only has to vary text size, but it has to support one of these compose characters on your printer in the first place. This should almost always be true for 5.1, since WordPerfect will create the character as a graphic if necessary, but may not be true for 5.0, since 5.0 can only use characters that are already available — in the printer, as downloadable fonts, or elsewhere on your system.

Also, the printer has to be able to move print position both forward and back. Some older printers may not be able to follow the Advance Up command to move back to the starting position. If your printer can do subscripts and superscripts, however, it shouldn't have a problem.

M. David Stone

Start WinWord in a data directory

By default, when you start up WinWord, the program assumes you want to load files from and save them to the WinWord program directory. Since I often want to work on files in another directory, I've found a simple way to tell WinWord to use a different directory instead.

Windows 3.1 can associate particular file extensions with particular programs — as with the .DOC extension for WinWord. If you set up your screen so you can see both File Manager and Program Manager at the same time, you can drag a file icon from File Manager to a Program Manager group, and Windows will convert it to the associated program icon to create a new entry in Program Manager.

Use a .DOC file to create a new icon this way, then start WinWord from the new icon, and the program will start up with the file loaded that you dragged over to Program Manager. The default file directory will also become the directory you loaded the file from.

You can take advantage of this feature to tell WinWord to use your preferred data directory. Create a blank file and save it under some descriptive name, such as BLANK.DOC or DATADIR.DOC. Then drag the file's icon into Program Manager. At this point, Windows should show the item as a WinWord icon. With the icon selected, choose File Properties, change the descrip-

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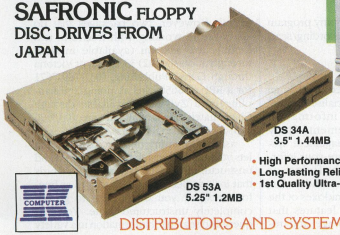
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tion to WinWord in the Description text box, and choose okay.

You should now be able to open WinWord by clicking on this new icon or selecting it and hitting enter. Test the icon to make sure it works, then delete the original WinWord icon from Program Manager by highlighting it and choosing File | Delete or hitting the Del key.

From now on, you'll be able to start WinWord in the right directory with the new icon. WinWord will load the blank file, but you can simply close the file and then load any file you want, without having to first go through the cumbersome process of changing the directory through the File | Open dialogue box.

Willard Kirste, Jr.

Australian Personal Computer RESPONSE

This suggestion tackles one of Microsoft's most annoying habits: encouraging you to dump all your files into a single directory. There are several approaches to starting in separate data directories, but as with Mr Kirste's solution, they're all somewhat hidden from view.

Creating an icon that will open a specific file is best reserved for those files that you actually want to open — as with a to-do list or calendar that you update regularly. Opening WinWord with a blank file loaded and then closing the file takes you to the right directory (with one exception we'll come to later), but having to close the file is unnecessary work.

A more direct way to start WinWord in the directory of your choice is to change WinWord's Working Directory. To do this, you highlight the WinWord icon in Program Manager and choose FileProperties. By default, the properties are set as WINWORD.EXE in the Command Line text box, and the WinWord program directory (typically C:\WINWORD) in the Working Directory text box. In the File Properties dialogue box, make sure WINWORD.EXE is preceded by its drive and full path in the Command Line entry, then change the Working Directory entry to the data directory of your choice. Now when you start the program from the icon, WinWord will wake up set to use your preferred data directory.

If you define the default data directory this way, you should be aware that the Working Directory entry will have no effect if you start WinWord another way — such as from the File Manager or by launching it from another program. This can be a plus if you use icons that start up with a particular file loaded, as described by Mr Kirste, since they'll still work as intended.

There's another way to set WinWord's start-up directory, and it too overrides the Working Directory setting. One of the optional entries in the [Microsoft Word 2.0] section of the WIN.INI file is **DOC-Path=,** which you can use to define the default document directory. The entry takes the form

```
DOC-Path=D:\DATAPATH
```

where D:\DATAPATH is the drive and path for the data directory. You can add this line to your WIN.INI file directly with any text editor. Simply open WIN.INI, search for Microsoft Word 2.0 to find the WinWord section, and add the entry on its own line.

Alternatively, you can enter the line from within WinWord without opening WIN.INI. Choose Tools | Options, then choose WIN.INI in the Category list box. WinWord will show you the Microsoft Word 2.0 section of WIN.INI. You can then browse through the Startup Options list box to see if there is already a DOC-path in the file.

If there is a DOC-path, you can change the setting by highlighting the line in the Startup Options list box, making the change in the Setting text box, and then choosing set. If there isn't a DOC-path entry, you can create one by typing DOC-Path in the Option text box, typing the appropriate path in the Setting text box, and choosing set.

WinWord will use the DOC-Path entry as its default data directory no matter how you start the program — even if you start it from File Manager, or start it from Program Manager using an icon that loads a specific file. If you only have one data directory or you absolutely want WinWord to start in the same directory every time, this method is your ticket. However, unless you have very few data files, it makes more sense to divide your files into directories — by project, client, type of file, or any other way that makes sense for the way you work.

If you use the Working Directory entry to define the default data file, rather than the DOC-path entry, you can create more than one WinWord icon, then start WinWord with the appropriate icon for the data directory you want to use.

M. David Stone

Databases

Sorting dissertation research

I need help in finding a database program that will help me sort my doctoral research. I would like to input the interviews and data from my field research in such a way that I can select the information based on a particular word or on several words.

For example, I might want to gather all of the information concerning the Tonga tribe, or only information containing both the words Tonga and Zambia. I would conceive of the information's being recorded as we would have done it in the old days — on a 3-by-5in index card that would have a heading followed by several paragraphs of information. Do you know of any program that would make this sort of recording/searching/sorting possible?

Allen Avery

Australian Personal Computer RESPONSE

You need a package that specialises in free-form information management. Many traditional PC database management systems require that you structure your information into fixed-length fields or variable-length 'memo' fields. And unfortunately, the FoxPros and Paradoxes of the world don't have a lot of features that facilitate free-form text storage and retrieval. However, two packages that do specialise in working with free-form text flexibly are askSam (available in NSW through infotastic (02) 337 5126; or Victoria through Garret Publishing, (03) 789 7671 for a RRP of $650 plus shipping and handling) and ZyINDEX (available through Charismatek Managerial Software, (03) 696 1255, $695 for single user).

askSam is an information manager that lets you mix and match both structured and unstructured data. You can create records that include delimited fields as well as free-form text, or you can choose to go the completely unstructured route. You can query and search for information in a variety

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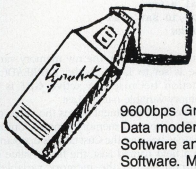
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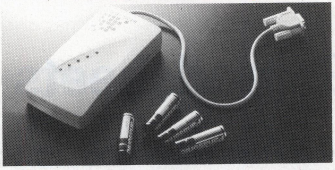
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of ways, and combine search expressions using Boolean operators such as AND and OR. askSam stores information in a proprietary format and includes a data-entry facility.

ZyINDEX is a file indexer used for text indexing and retrieval. While askSam includes a text editing facility, ZyINDEX acts more as an accessory to your own text editing tools. To use ZyINDEX you first create your documents (or records) independently using your own favourite tool, and then use ZyINDEX to generate indexes and search your documents. You'll find ZyINDEX's search facilities to be quite flexible. Since ZyINDEX is only an index and retrieval tool, you cannot edit records from within ZyINDEX — you must use your own tools. And you must ask ZyINDEX to update its indexes whenever you make changes to your documents. Fortunately, ZyINDEX supports a wide variety of popular file formats, including Microsoft Word for Windows, WordPerfect for DOS and Windows, XyWrite and ASCII, to name a few.

Which should you choose? askSam seems better suited to your request, since it's a single-product solution that lets you flexibly record and search/sort your information. Note that the documentation is somewhat weak, and the product itself is a little difficult to learn. It'll require some experimentation. ZyINDEX is a better choice if you would like to do all your editing using your own word processor. ZyINDEX may perform some queries faster than askSam, since askSam does not build indexes. The trade-off, of course, is that with ZyINDEX you must keep your indexes current.

Sal Ricciardi

A VARREAD( ) caution

The VARREAD( ) function in FoxPro is designed to return the name of the memory variable, array element, or field used in the currently active GET. You'll recall that the GET statement is used to edit a value on the display.

The VARREAD( ) function is useful, for example, in a function called by the WHEN or VALID clause on your GET statement. The WHEN function is called before the user enters the edit field, and the VALID clause is called when the user leaves the field. With VARREAD( ), you can write a function that determines for itself which GET is currently active.

For example, if the active GET is editing a memory variable named Last, the VARREAD( ) function would return LAST. Note that if the GET is editing a field named Last, as opposed to a memory variable, the VARREAD( ) function *still* returns just LAST. Unfortunately, the VARREAD( ) function does not prefix memory variable names with M. or field names with the table alias and a dot. This can cause problems if you're not careful.

For example, consider the following, where the Cust table has a field named Last:

```
USE Cust
m.Last = "Ralph"
@10,10 GET m.Last ;
    WHEN foo( ) VALID foo( )
READ
RETURN

FUNCTION foo
PRIVATE mv
mv = VARREAD( )
mval = &mv
@ 20,10 SAY mval
RETURN
```

In the foo function, the mv memory variable is set to LAST by the VARREAD( ) function because the active GET is a memory variable named Last.

The next statement stores the value of LAST to the mval memory variable. Unfortunately, because the Cust table is open and has a field named Last, the field's value is returned — not the memory variable's value.

Hence, when you use VARREAD( ) you must remember that it does not distinguish between memory variable names and field names (a flaw, in my opinion). If you know that you want the memory variable and not the field, you can work around this by using 'M.' +VARREAD( ) instead.

Sal Ricciardi

Spreadsheets

Adding alternate rows

I have been trying to write a small macro routine in Lotus 1-2-3, Release 2.01, that adds every other line in a range. For some reason I have been unable to get the following code to work:

```
{for A100,1,51,2,L5}
@sum(L5..L55)
```

The starting point of my range is L5, and the ending cell is L55; I want to add all the odd-numbered lines, including L55. I wonder if you can help me do this.

Jak Ninyo

Answering your Personal Computer RESPONSE

The {for} command takes five arguments — a *counter cell*, a *starting value*, an *ending value*, a *step value* and a *cell reference*. The last argument should be a reference to an address containing some macro code. The command tells 1-2-3 to do the following:

1. Set *counter cell* to *starting value*.
2. Execute the code at *cell reference*.
3. Increment *counter cell* by *step value*.
4. If *counter cell* is now greater than *ending value*, stop. Otherwise loop back to step 2 and continue.

From your letter, it sounds as though cell L55 — the cell reference argument in your {for} statement — does not contain macro code; it appears instead to contain one of the numbers that you want to add. But even if L55 contained the statement @SUM(L5..L55), your macro would merely execute that formula 25 times, yielding the same result on each execution. In other words, {for} is the wrong tool for this job!

The macro shown in Figure 1 should do the trick. The first line of this macro turns off screen and panel updates for the duration of the macro run. This is optional, but the macro will be hopping through the range that it's adding, so without {windowsoff} and {paneloff}, 1-2-3 will have a lot more work to do.

The second line initialises a cell named *total* to 0. This one is important; if you omit it, each run of the macro will add a new value to whatever was in total before.

Line three moves the cellpointer to the start of the range you want to add. I've given this cell the name *startcell* for the sake of generality. If you're always going to be adding the same range of numbers (L5..L55, for example), you could hard-code the starting address.

Line four, to which the name *loop* has been assigned, adds the value at startcell to

ALTADD.WK1 — Complete listing

```
     A                                   B
104  \s      {windowsoff}{paneloff}
105          {let total,0}
106          {goto}startcell~
107  loop    {let total,total+@cellpointer("contents")}
108          {down 2}
109          {if @cellpointer("type")<>"v"}{goto}total~{left}{quit}
110          {branch loop}
111
112  total
```

Figure 1: *This 1-2-3 macro adds up every other number in a column*

the value of total. Line five moves the cellpointer down two rows. Line six checks to see if the current cell is blank — that is, to see if we've come to the end of the range. If the cell is blank, the macro has finished, so it does a {goto} to the total cell, then moves one cell to the left so you can see the word *total*. Then the macro stops.

If the current cell is not blank, the macro branches back to loop and the process is repeated.

For this to work, you must do the following:

1. Assign the names *\s*, *loop*, and *total* to the cells immediately right of those labels. In Figure 1, those cells are B104, B107 and B112, respectively. On your worksheet, however, they may be different.

2. Assign the name *startcell* to the first cell you want to add.

3. Leave two blank cells directly below the range you want to add.

Be aware that this macro doesn't produce a 'dynamic' formula. If you change the values in the range you're adding, you'll need to rerun the macro.

Craig Stinson

Clipboard shortcuts in Excel dialogues

I use Excel 4.0 for generating price quotations on computer equipment. I find the FormulaNote command very useful for adding text to explain the significance of new product technology. Unfortunately, while you're in the Note dialogue box, the Edit menu is unavailable, so you can't choose the Paste command to copy text in from the Clipboard. Nor is there a button in this dialogue box that would let you import a text file from disk. I searched through the manual and found no help. I even called Microsoft's technical support line and got no help. So I resigned myself to retyping information directly into the Note window.

Then quite accidentally, I happened to press Ctrl-V one day while creating a note, and voila, I got a paste from the Clipboard. It turns out the keyboard shortcut works even though the Edit menu is not available.

This discovery has proved to be a major time-saver for me.

Bob Chambers

Australian Personal Computer RESPONSE

A handy discovery, indeed. The other Clipboard shortcuts — Ctrl-X to cut and Ctrl-C to copy — also work in the Note window. And all three shortcuts also work in some other contexts where the Edit menu should be, but is not, available. For example, you can use these shortcuts in the Data | Form window or in a custom dialogue box created via macro.

One thing you cannot do, however, is select a worksheet cell, copy it to the Clipboard, then choose the Note command and paste the cell with Ctrl-V. You must fill the Clipboard from an application other than Excel. When you copy from Excel to the Clipboard, Excel expects your next step to be a paste. If you do anything else before pasting — such as pulling down the Formula menu and choosing Note — Excel empties the Clipboard.

Craig Stinson

Networking

Routing incoming faxes

We use a fax server to send out hundreds of faxes a week from dozens of PCs on our LAN. We'd also like to receive incoming faxes, but we really don't know how to handle them. Having the network administrator read every incoming fax is a big job, and it deprives everyone of what little privacy a fax provides. Is there any way to steer incoming faxes directly to their intended recipients?

Australian Personal Computer RESPONSE

The technology for internally routing faxes continues to improve, and there are now five good techniques you can use instead of forcing someone to read every incoming fax. Here are the five techniques, along with a brief description of each:

- 'Read' a line of text: Routing incoming faxes by reading a line of text involves using OCR software to look for a specifically formatted line containing the name of an addressee. It works, but callers must know how to format the fax.
- 'Read' DTMF tones: DTMF (dual-tone multifrequency) refers to the dialling tones produced on a phone's keypad. Some devices allow the sender to generate Touch-tone signals after the connection is made in order to designate the receiver. This technique is useful because it can accommodate many recipients, but it requires special actions on the part of the sender.
- Recognise the incoming line: If your fax server uses a multiline adaptor, it can route faxes to individuals or to workgroups based on the incoming line.
- Recognise the incoming fax machine: Recognising the number of the incoming fax machine, called the Customer Subscriber Identification (CSID), is a useful trick because the sender doesn't need to take any special actions, but the sender must use a specific fax machine.
- Recognise distinctive rings: Distinctive ringing is a technique offered by your telephone company. The telephone company sends calls directed to different phone numbers over the same incoming line using different ringing

patterns. Some modems and fax machines can use distinctive ringing to determine when they should answer, and some fax servers can use the distinctive ring to route the incoming fax to a specific mailbox. This technique doesn't require any knowledge or action on the part of the caller, and the caller can use any machine to place the call, so it's quite convenient.

Frank J. Derfler, Jr.

Protecting your network from viruses

Do viruses spread across networks? We've had two computer virus infections in the last year, but nothing seems to have gone across our LAN.

Was this just luck, or do we need to take precautions?

David Wallisch

Australian Personal Computer RESPONSE

By far, the most common source of computer virus infection is the boot sectors of floppy disks. Since the boot sector information doesn't travel across the network, common viruses like the Hong Kong virus or the Dark Avenger don't cross networks or bulletin board systems. Your best protection against these forms of computer viruses is the removal of the floppy disk drives from the PCs in your organisation. Let the PCs boot from their internal hard disks and load new applications across the network. You'll not only protect against the introduction of viruses, but also against the theft of valuable business information that unscrupulous people might carry away on floppy disks.

There are other types of potent viruses, however, that don't live in a floppy disk's boot sector; instead, these viruses burrow into legitimate files. If these files are copied across the network, the infection can be spread to other computers.

There are two approaches in virus-scanning software to running checks for viruses on a network file server: running the software on a client PC or on the file server itself. These two approaches are similar to the techniques used for backing up file servers.

The programs that run on a client PC are useful for scanning a specific virtual drive at a specific time of day. They work with any number of servers and with any type of server software. The programs that run in the server, like the Central Point Anti-Virus NLM or VAP for NetWare, can continually scan files as they are copied or moved across the network. These products do take some processor cycles, but NetWare servers typically have CPU power to spare.

Frank J. Derfler, Jr.

PCs

Running Windows on laptops

I have a Compaq LTE 286 portable with a 20M hard disk, 2.7M of RAM, and a math coprocessor. What do I have to do to upgrade this system so it will run Microsoft Windows 3.1, Word for Windows, and Excel?

Fridrik Bjarnason

Australian Personal Computer RESPONSE

While it's possible to install and run Windows 3.1 on this system, you probably don't want to. Your money would be better spent on one of the new-generation laptops designed to run Windows.

Windows 3.1 can run on a 286, but you don't get the benefits of virtual memory and other performance features that you get in 386 Enhanced mode. The Windows specification also recommends at least 1.6M of memory, while Word for Windows and Excel each require at least 2M. Even though you have this much memory, performance would be improved by adding more. Unfortunately, you can't add any more memory to your laptop.

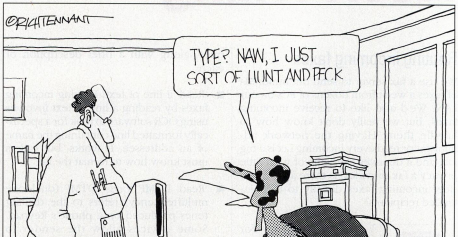
The 20M hard disk also poses a problem. Windows requires 6M (although 10M is recommended), Word for Windows needs 5M for a minimum installation (15M is needed for the complete program), and Excel requires another 5M. You'd need to switch to at least a 40M drive, and an 80M model would be even better.

Your double-scan CGA display may also be inadequate. Many users find it too coarse to use for a graphical interface such as Windows.

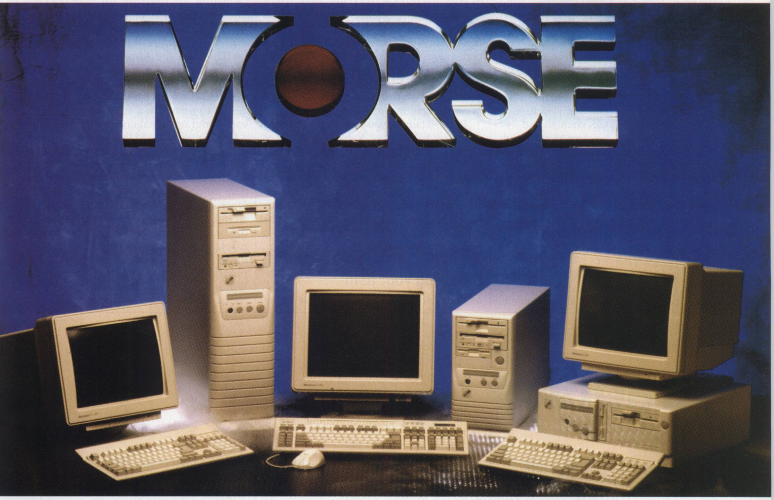
Finally, the LTE 286 processor runs at only 12MHz, and even if you could resolve the memory, storage and display limitations, there's no way around the CPU bottleneck. You can buy a 386SX portable that runs nearly twice as fast, with an 80M hard disk, plenty of memory and a VGA LCD panel, plus DOS and Windows already installed, for about $2000.

Trying to run Windows 3.1 applications on anything much less than this is likely to be a source of frustration and disappointment.

Alfred Poor



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Operating environments

Can overwritten files be recovered?

Sometimes I unintentionally replace one file with another. In WordPerfect, for example, I might retrieve an existing file named LETTER1 and make extensive changes, perhaps deleting large portions of it. I *intend* to save the file as LETTER2 but mistakenly save it as LETTER1. And when WordPerfect asks 'Replace LETTER1?' I unintentionally answer Yes, and the new LETTER1 replaces the old LETTER1. Is the original file lost forever?

I reviewed the Norton Utilities documentation and learned they can recover a file that has been *deleted*. But can I use The Norton Utilities to recover a file that has been *replaced* under the same name?

Robert D. Hoagland

Unfortunately, overwriting a file is a much more permanent action than just deleting it! To delete a file, DOS changes the first character in the file's directory entry to mark it as deleted, and it marks the disk space occupied by the file as available for reuse. The file's data is completely untouched by the deletion process, at least until the data space gets recycled. That's what makes unerase utilities possible — the only information lost when you delete a file is the first letter of the filename.

When a program overwrites a file, either the new data will directly replace the old ondisk, or the program will wipe out the old file and create a new file with the same name. In the first case, the data is totally lost. In the second case, there's a chance that the file's data still exists on disk. However, there's no deleted directory entry to give an unerase program a toehold. You might be able to locate and gather chunks of the file's data with The Norton Utilities, but it would be a tedious process with no guarantee of success. DOS 6.0 adds a new Delete Sentry feature to the UNDELETE utility, and when it's active you can recover some overwritten files. To protect drive C: with Delete Sentry, add a line like

```
UNDELETE /SC
```

to your AUTOEXEC.BAT file. Now when files on drive C: are deleted, DOS will move them to the hidden directory C:\SENTRY. If the sentry files take more than a specified percentage of disk space, DOS deletes the oldest. Delete Sentry protection costs you disk space, and UNDELETE remains resident in RAM, so this partial protection from overwriting files comes at a price.

In the example you describe, you could configure WordPerfect to make backups of the original file before overwriting it. Press Shift-F1 to enter Setup, E for Environment, and B for Backup options, and set the 'Original Document Backup' option to Yes. Now when you overwrite a file in WordPerfect, the original will be saved, with its extension changed to BK!

Neil J. Rubenking

Shrinking your path

As I added more and more software to my hard disk, my PATH grew out of control. Since I almost always start programs from within Windows, I simply set the correct location of each program with the Command Line item in the Program Item Properties dialogue box.

If I do want to start a program from the DOS prompt, it's no great hardship to change to the appropriate directory. Now my PATH is just C:\DOS;C:\WINDOWS!

Mark D. Mylin

These days it seems like every program — whether it is based in DOS or in Windows — wants its directory on your PATH. There's a practical limit of 122 characters: the 127-character limit of the DOS command line minus the five characters, PATH=. And the longer the PATH, the longer it takes DOS (or Windows) to determine that a given program is not on the PATH. Windows has the built-in ability to associate a full pathname with each Program Manager icon. It takes only a few minutes to add this information for all your programs, and then your PATH can shrink to almost nothing.

There is one more step you need to take before you can shrink your PATH. Open the WIN.INI file and find the [extensions] section. Entries in this section define associations between particular file extensions and the programs that act on those files. Fill in the pathname for any program that doesn't reside in the DOS or Windows directory. That's all!

Neil J. Rubenking

Graphics

Becoming Mac-compatible

I'm a fan of the DataViz product Mac Link Plus which makes file transfer between Mac and PC application programs transparent by allowing me to read DOS disks on my Macintosh. Are there any programs for Windows that do file transfers in the same way — without any special cables or hardware?

Robert Leong

I've recently purchased a new IBM-compatible computer after having relied on an original 128K Macintosh for the past nine years.

I'm very happy with my system, and the transition to Windows hasn't been as painful as I expected.

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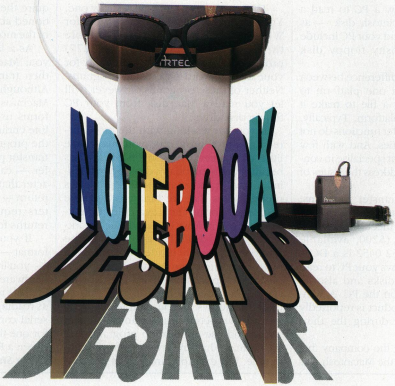


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COMDEX/Fall'93 A371 A369 South Annex

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Parallel Port Patent No.
Germany: G9212618.9
Taiwan: 76190

My problem is that I've accumulated a multitude of Mac files that are stored on 3.5in, 400K single-sided Mac floppy disks. Many of the files are text files created in various versions of MacWrite that I'd like to convert for use on my new system. Several local vendors say they can convert the files, but since they charge by the file, the cost would be more than I paid for my computer!

Do you know of any software I can use to convert the files?

James M. Gambill



There are software-only solutions that will allow a PC to read a Macintosh disk — as long as both your Mac and your PC include 3.5in, 1.44M high-density floppy disk drives.

But — there is a big difference between transferring a file from one platform to another and converting a file to make it usable on a different platform. Typically, programs that offer transfer functions do not include conversion utilities. And with few exceptions, programs that specialise in conversion utilities do not address the issues of file transfer.

If you only need transfer functions, there are several programs on the market that should be able to meet your needs. Mac-to-DOS Transfer ($200, available through Mitsui, (02) 452 0452 is a DOS-based program that allows your PC to read and write Mac floppy disks and also let you format Mac disks on the PC. A Windows version of this product is reportedly shipping in the States during the third quarter of this year.

In addition, DataViz, the company that makes MacLink Plus for the Macintosh, has announced a PC product called Conversion Plus for Windows ($253, available through Conexus, (02) 975 2799. For more information on this product, see First Looks, October 1993 *APC*). Conversion Plus allows you to both transfer and convert files between PC and Mac programs. Like its Mac sibling, Conversion Plus for Windows offers a library of translation routines for such popular word-processing programs as MacWrite, Ami Pro, Microsoft Word, Word for Windows and WordPerfect Conversion Plus can also translate between the Windows metafiles and PICT picture formats (even if the pictures are embedded in a word processing file).

The issue of conversion is a sticky one. You may find that a program like Word for Word/Professional ($249, available through Mindscape, (02) 899 2277) provides the perfect conversion utility for your mix of word-processing programs. Neither of these programs, however, will let you read a Mac disk from your PC floppy disk drive.

If you are working with the most current graphics programs, you may have little or no need of conversion utilities because many of today's desktop publishing, drawing and image-editing programs produce files that are binary-compatible across platforms. For example, QuarkXpress for Windows can read Mac QuarkXpress files directly, and the Adobe PhotoShop format is identical on both platforms. The same is true of graphical business applications. Excel files, for instance, can be opened on the Mac or under Windows. If you plan to regularly transfer files between a Mac and a PC, plan ahead and use application programs and file formats that are cross-platform compatible. For example, instead of generating .BMP files (a Windows-specific format) with your scanning software, create TIFF or EPS files because both Macs and PCs can read them. One caveat: Even if your application boasts cross-platform compatibility, you'll still need to massage the filename in order to deal with the incompatible filenaming conventions of the Mac and PC operating systems. Mac files can contain 32 characters as opposed to the DOS filename limit of eight. Mac filenames can also contain characters that are illegal in DOS, such as the question mark, backslash and asterisk. Finally, Mac filenames don't need an extension, but many DOS and Windows applications require them. All the transfer utilities mentioned above let you rename files as part of the move from one platform to another.

As a last resort, you can export all of your Mac application files to ASCII and then transfer the ASCII files to the PC. Although vanilla ASCII is identical on the Macintosh and under DOS, the two platforms use different characters to define line endings. The good news is that all of the programs listed here — even the file-transfer programs like Mac-to-DOS Transfer — can replace the line ending character that is used on the Mac (a carriage return — 13) with the line ending characters required by the PC (two carriage returns followed by a line feed — 10).

If you're working with any other Mac format — that is, either a 400K or 800K disk — you'll have to use a combination of hardware and software to transfer files from the Mac to the PC. While not as convenient as reading Mac files directly, a null-modem serial connection is an appropriate choice for one-time or occasional file transfer between a PC and a Mac.

Luisa Simone

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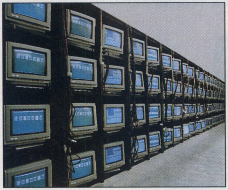
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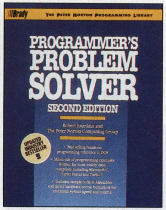


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Response Advertising 2969AC

Hot off the presses

This month, we muck around with morphing and look at some of the latest guides to DOS 6, DiskDoubler, AutoDoubler and OS/2.



Programmer's Problem Solver: Second edition

Publisher: Brady
Author: R Jourdain et al
Distributor: Prentice Hall
Telephone: (02) 939 1333
Price: $61.95
ISBN: 0-13-720194-X

Programmer's Problem Solver is from the Peter Norton Programming Library series. It aims to help us write better programs for DOS machines. The book is organised around hardware topics and each chapter starts with a 'minitutorial', which is followed by detailed solutions to common DOS programming problems. The chapter on using a mouse, for instance, covers fifteen mouse management issues, including confining the mouse to a portion of the screen and taking analogue or digital input from a game port.

Fifteen hardware areas are covered, including memory, sound, disks and video.

The book is laced with examples in 8086 assembler, Basic, Turbo Pascal and C (both Microsoft and Borland). For most problems, Jourdain presents solutions at three levels — using library functions, calling the operating system, and through direct access to the hardware.

This task-oriented book lives up to its promise. Well written and clearly laid out, its many solutions are easily accessible. The mini-tutorials are useful primers on the DOS operating system. For the less-than-perfect DOS programmer, the book would probably pay its way if it solved only one problem.

Michael Aitken

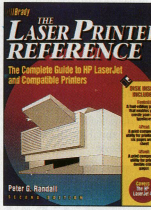
The Laser Printer Reference

Publisher: Brady
Author: Peter Randall
Distributor: Prentice Hall
Telephone: (02) 939 1333
Price: $81.95
ISBN: 1-56686-050-4

How can anyone write a whole book about laser printers? You only have to use one for a week and you've discovered the only important piece of information you need; every laser printer contains a stress detection circuit — the more urgent the job, the more likely the printer is to malfunction. As you get increasingly anxious, the printer detects your rising stress level and the malfunction becomes more serious, causing your stress level to rise further, causing the printer to malfunction even more severely, and so . . . A process technically known as a *feedback loop*.

Stress detector circuits are the one thing not mentioned in Peter Randall's book, but everything else you could possibly need to know is; everything from unpacking and installing a new printer right through to the pros and cons of different types of paper is covered in elaborate detail. The book focuses on Hewlett-Packard LaserJets, but almost all the information is relevant to any laser printer, even PostScript lasers.

There are extensive sections on troubleshooting and a free disk of utilities, including a reasonable font editor. The book is clearly written but suffers slightly from poor illustrations. The other minor irritation is that, being a US title, it suffers from the widespread American delusion that the rest of the world doesn't exist. (How else do you explain the fact that their domestic baseball tournament is called the



World Series?) All the paper sizes and prices are American, dimensions are in inches and temperatures in Fahrenheit. Is it too much to expect that international equivalent measures should at least be mentioned in books clearly intended for an export market?

Despite these quibbles, *The Laser Printer Reference* would be

a very useful purchase for anyone who has to provide technical support for laser users.
Jim Endersby

DOS 6 Insider

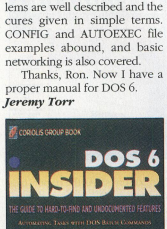
Publisher: Wiley
Author: Ron Pronk
Distributor: Jacaranda Wiley
Telephone: (07) 369 9755
Price: $54
ISBN: 0-471-59394-X

DOS 6. A good, solid upgrade. Lots of good features. And a manual only fit to put under the leg of that wobbly kitchen table. So what does Microsoft do? It puts everything in a nice, big help file which you can't read if the system crashes and you don't know how to fix it because it works differently to your old DOS (and which you had a good, thick manual for). Smart.

Enter Ron Pronk, author of *DOS 6 Insider*. In the foreword, he says he aims to come to the rescue if the official User's Guide fails you (it will). He also says he will, warts and all, provide tips and warnings invaluable to all users.

The good thing is, he does. He not only gives a full and well-written low down on using the integral utilities like MemMaker, Backup and DoubleSpace, he also tells you how to link into the real world when using the likes of Stacker or QEMM. Potential hardware and software problems are well described and the cures given in simple terms. CONFIG and AUTOEXEC file examples abound, and basic networking is also covered.

Thanks, Ron. Now I have a proper manual for DOS 6.
Jeremy Torr



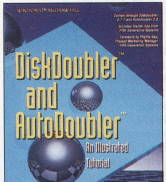
DiskDoubler and AutoDoubler

Publisher: Windcrest/McGraw-Hill
Author: Marvin Bryan
Distributor: McGraw-Hill
Telephone: (02) 417 4288
Price: $29.95
ISBN: 0-8306-4547-0

As an exercise in natty design and layout, this book is a winner. As a useful extra on every Mac user's bookshelf, I am not so sure.

It has tons of tasteful graduated-tint triangles, circles and boxes, screen shots by the bucket load and a very friendly typeface throughout. But it doesn't really go much further than the manual you get with the Fifth Generation Systems' file compression products described. In fact, much of the copy is decidedly thin: ". . . never ignore error messages," and a screen clip labelled "The Disk Doubler Installer Screen" being just two examples.

In fact, although the book does give some advice on problems such as SCSI drive



malfunctions when using compression, it seems to read more like a third-party advert for DiskDoubler and AutoDoubler. After having read it you are likely to be scared silly of major data loss if you are using any other compression utility.

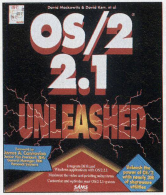
Overall, this book cannot be described as a valuable addition to the global knowledge pool. Use that $30 for some good Mac shareware instead.
Jeremy Torr

OS/2 EXTRA!

Publisher: Windcrest/McGraw-Hill
Author: L.Dorfman & M.Neuberger
Distributor: McGraw-Hill
Telephone: (02) 417 4288
Price: $36.95
ISBN: 0-8306-4567-5

Unless you are a die-hard OS/2 fan, love programming, and are disappointed with IBM's coverage of character-mode interface commands in its OS/2 Technical Library, this book is not for you.

It is a very specific volume addressed to a very specific user group which will no doubt attack it greedily. It comes with nearly 200 pages of well-presented and IBM-sourced in-



formation. Its target is C programmers working with non-GUI (character-based) software via the KBD, MOU and VIO subsystems provided within OS/2.

As well as the normal syntax, operation and entry details, the book gives short examples of sample lines, and also includes a comprehensive error code number, description and signage section. Although basically a reference manual, it has been well laid out into the three (Keyboard, Mouse and Video) sections and is easy to navigate through thanks to the index and contents.

At the bottom line, this book is probably worth little more than a cursory glance if you are not into OS/2 programming. If you are, it is definitely worth a place on your shelf, and much more than its $36.95 list price.
Jeremy Torr

Morphing Magic

Publisher: Sams Publishing
Author: Scott Anderson
Distributor: Prentice Hall
Telephone: (02) 939 1333
Price: $51.95
ISBN: 0-672-30320-5

I first saw morphing when it was still a hot new special effect, in the film *Terminator 2*. In it a liquid metal robot was able to turn into the shape of anything that it touched. Since then we have seen morphing used in a spate of music videos and ads.

One could be forgiven for thinking that it's all been done before by those big-budget, post-production houses. But, the good news for PC users is that morphing software is available on the PC and it is getting better and cheaper by the day.

I have tried my hand at it and have to admit that there is a great deal more to it than you might think. I had the expectation that all I needed to provide was an image and the computer would do it all for me. Well it sort of did, but the result was nothing to dance about.

Now Scott Anderson has written a book that sheds light on this fascinating subject. Morphing Magic is a feast of information on morphing. There is a detailed run down on its recent use in Hollywood, with some great full-colour illustrations. The book also covers the maths, programming and techniques used to create morphing and includes software with C source code. If you consider yourself an artist who likes to tinker with a bit of programming code, then Morphing Magic is for you.
Henry Thomas



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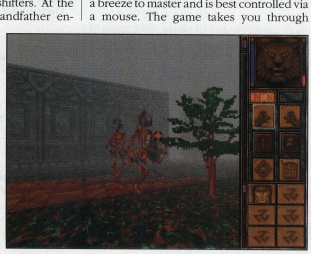
Shadowcaster

BY JULIAN SCHOFFEL

The creators of Wolfenstein are back with stunning visuals and innovative options.



Shadowcaster is a first-person perspective action/role-playing game from Origin. It features the sophisticated and highly successful 3D engine from ID Software, the creator of Wolfenstein. But there is one important difference; Origin has used the talents of Raven Software to create visually stunning fantasy artwork. This game looks extremely impressive! You play Kirt, the descendant of a magical race of shapeshifters. At the start of the game your grandfather enlightens you about your true heritage and informs you that you are the last hope of a dying race. It is up to you to find and destroy the evil Veste. In order to do this you must acquire the ability to transform into six different forms. They range from the cat-like Maorin, to the huge stone giant Grost. Each of these forms have innate abilities which must be exploited if you are to succeed at your objective.



Shadowcaster has a number of innovative features; one of the most impressive provides you with a picture for each savegame, making it impossible to forget which game you wish to load. However, there is a down side to this; there are only a measly four savegame slots available. Shadowcaster also has a comprehensive mapping system which automatically shows you where you have and haven't been. The 360-degree scrolling is very smooth with the added bonus of the megaview option, which allows you to increase or decrease the size of the viewing area according to the speed of your machine.

By far the most praiseworthy aspect of Shadowcaster are its graphics. Raven Software has done a truly splendid job. The detail of the artwork on the dungeon walls is incredible and each metaform transformation is accompanied by a very nifty morphing sequence. The graphics do have one minor flaw: walls and monsters have a tendency to become a bit blocky when you get too close to them.

The gameplay of Shadowcaster is very simplistic and fast, which makes it more of an action game than a true RPG. Combat is a breeze to master and is best controlled via a mouse. The game takes you through ruined temples, underwater labyrinths and fiery dungeons which you view from a number of different perspectives according to your current metaform. The trick of Shadowcaster is to figure out which of Kirt's metaforms suits which situation best at any given time.

The game contains quite a few puzzles, although they can all be solved using a logical approach. While I enjoyed the game immensely I was a little disappointed at the scantiness of the plot. If you're looking for a game with a rich storyline that you can really immerse yourself in then Shadowcaster is definitely not for you.

Overall, Shadowcaster is a very atmospheric game in the same genre as Wolfenstein. The sound-effects and music are great, the graphics are also well and truly up to par. I finished the game in a relatively short period of time (about 15 hours) with the combat level set to normal. This brings me to an important point: the price. Shadowcaster retails at somewhere around $100. This is a lot of money to pay for something which, while being of a very high quality, may not last you very long. Nevertheless, Shadowcaster is definitely worth a look.

Shadowcaster
Distributor: Electronic Arts
Telephone: (075) 911 388
Price: At dealers' discretion (approx. $106)

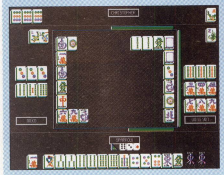
Board and listless?

BY JEREMY TORR

Take a break from intergalactic shoot-ups with a touch of drawing room relaxation. Computer board games provide a gentler alternative. Sometimes.

Mah Jong

Fancy some Oriental culture? Mah Jong has been around for around three thousand years, and has now made it onto the PC. Loaded from two floppies, the software explodes into over 4M of very impressive graphics and sound files.



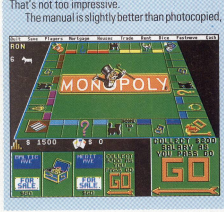
Beginners are treated to a tutorial. Experts can plunge in and play against a range of players from the wily to the beginner. Along the way you get treated to some pretty decent sound and speech (for a non-CD game). As a way to learn Mah Jong, this package is great. As a substitute for the intellectual jousting provided by human players, even with its excellent sound and graphics, it is just not the same.

Board Games

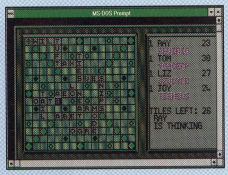
This bumper bundle comes complete with a cupboard full of the old favourites ported to the VDU and licensed by an offshoot of the Virgin group. Included are Risk, Monopoly, Cluedo and Scrabble.

The pack is hot on perceived value, mediocre on presentation, long on age (some titles date back around to 1986) and decidedly variable on delivery. It comes on four floppies. One for each game, with one (Scrabble) that won't play off the hard disk. That's not too impressive.

The manual is slightly better than photocopied,



but does go into reasonable detail about the four games. But let's face it, the included versions of Scrabble and Cluedo have done their dash. Cluedo has a terrible display and almost indecipherable EGA writing. Scrabble is, if anything, slightly worse — two-tone EGA — and crashes at the slightest hint of any problem, locking up the machine. Not high-class game play at all.



The other two games, Risk and Monopoly, rescue this game set from being a total disaster. Monopoly is well-designed with nice graphics and cheeky animations. It is quite amusing to play, either against the PC or real opponents.

Risk makes the most of the small screen and allows protracted wars to be fought just like the real thing. It also has reasonable graphics, although we had some trouble getting the sound to work. But if you are looking to spend nearly $60 on board games, and already have Monopoly and Risk, get a couple of the real ones in the sales. It has to be better value, and you will get sound with them too.

Pictionary

This game comes in a glossy box and looks as though it could be good value at $19.95. It has a fairly small (four pages!) manual and a couple of category cards. That's it for the includeds. Loading is easy as there is only one disk to copy.

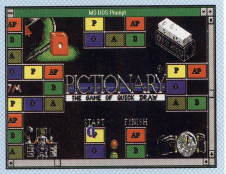
Although the release notes say it was released in July 1993, and is a new release, the game itself comes up with a credit dated 1989. And boy, does the display look like it. You choose between Hercules (remember that?) and EGA. More blurb on the pack describes it as a "lot of fun . . . loads of colour." That may have been the case in 1989, but not today. And as for the sound, it produces those PC speaker beeps that drive you barmy at every mouse move. The game itself involves some quite clever drawing exercises, and has its own drawing package, but frankly, my dear, it is not worth the effort of loading.

Trivial Pursuit

Here's another game in the same genre as Pictionary. Same box style, same small manual, but there is a basic difference. If anything it is worse than Pictionary.

If it was a simple text-based game with no pretensions, it would be less of a shock to see those green and brown CGA graphics, hear those annoying beeps and have to use the function and keyboard keys to use the thing. As it is, the box and the blurb: "'. . . months of fun for all the family," lead the user to think they are getting a game up to current standards of programming. They aren't.

It may well contain over 3000 exciting questions, and in pure usage terms, yes it does work. You will also be pleased to hear you can get it for the Commodore 64, Sinclair Spectrum, Atari XE and Amstrad CPC range. If there are any left in use. If you see this game on the shelves, don't even pause. Buying it would be the ultimate in Trivial Pursuits.



Where do you get it?

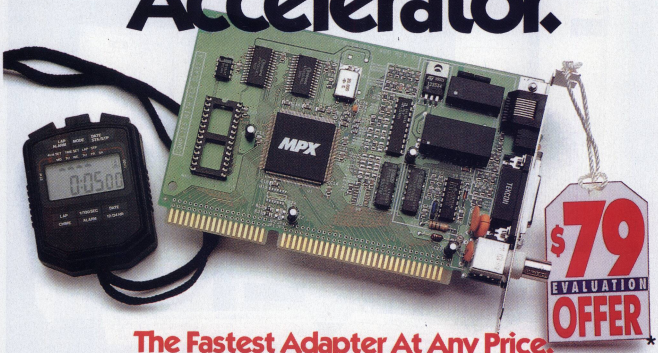
Mah Jong
Distributor: Electronic Arts, (07) 591 1388
Price: At dealers' discretion

Board Games
Distributor: Metro/Playcorp, (03) 329 1999
Price: $59.95

Pictionary
Distributor: Metro/Playcorp, (03) 329 2999
Price: $19.95

Trivial Pursuit
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PC Super Market

DECEMBER 1993

Buyer's guides:
486 PCs under $2000
Multimedia PCs under $3000
Edutainment software

Guide to buying direct

Part 4: Protecting your investment

Upgrades — more for less

Companies inside . . .



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Display	Active Matrix	Active Matrix	Active Matrix	Active Matrix	Active Matrix	Active Matrix
Local Bus	✓	✓	✗	✓	✗	✗
Docking Station (option)	✓	✓	✓	✓	✓	✓
Battery Type	NiMH	NiMH	NiMH	NiCad	NiMH	NiMH
Software Bundle	MS DOS 6.0 Windows 3.1	MS DOS 6.0 Windows 3.1	MS DOS 6.0 Windows 3.1	MS DOS 6.0 Windows 3.1	MS DOS 6.0	MS DOS 6.0 O/S2 2.0
Warranty (months)	60	36	36	12	12	36
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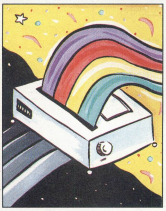
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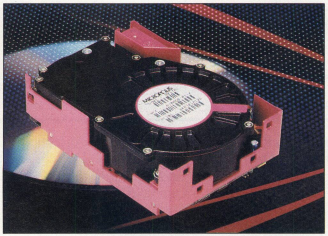
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10 New and improved
Announcements of new products and upgrades.

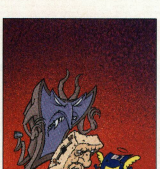
14 Company profile
A computer superstore or a computer dinosaur? Harvey Norman has opened up the first computer superstore in Auburn. Harvey Norman's managing director, Gerry Harvey, provides *PC Super Market* readers with compelling arguments as to why the mums 'n dads and corporate buyers will be lining the aisles in this new venture.

52 Price watch
In a slightly amended Price watch section for December only, our Price watch team looks at affordable computer product ranges which we would like in our Christmas stockings. To increase the amount of product we could cover, distributors were contacted instead of retailers, as is our norm. Product ranges covered include 486 PCs costing under $2000, multimedia PCs under $3000 and edutainment software. The information is portrayed in our Buyer's Guide tables.

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Ever get the feeling that the (PC) world is passing you by? In this feature *PC Super Market* looks at how you can protect your original investment by upgrading cheaply and safely.

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The second step



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Correction

ACA Pacific was listed as the distributor for Kurta digitisers. We have been informed by Polaroid Computing that it is the authorised Australian distributor of Kurta products. Polaroid computing can be contacted on (02) 950 7050.

PC Super Market
DECEMBER 1993

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PUBLISHING

PUBLISHER Richard Walsh
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Standard subscription rate: Australia $70.00 per annum.
Distributed by Network Distribution Company,
54 Park Street, Sydney, 2000.
Telephone: (02) 282 8777
Australian Personal Computer Magazine published by ACP Computer Publications
a division of
ACP Publishing Pty Limited (ACN 053 273 546)
Sydney Office: Level 6, 54 Park Street, Sydney, 2000.
Telephone (02) 288 9111; fax (02) 267 4903;
telex AA 20514 CONPRES.
Melbourne Office: 102 Toorak Road, South Yarra, 3141.
Telephone (03) 823 6333; fax: (03) 823 6363.
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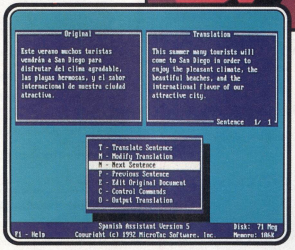
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PC MAGAZINE

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PRINTER SHARING WITHOUT A NETWORK



Inexpensive Data Link lets you share your printer with up to 20 PCs

Data Link is a modular low-cost solution for simple printer sharing requirements. It lets you share your printer with up to 20 PCs.

Start with two PCs and keep adding more as your needs grow.

The Data Link's fast 6,250 cps transmission speed (that's 375,000 characters a minute or 180 average A4 pages of text!) gets your job down the line pretty quickly.

And as for distance, there's no real barrier. You can print up to 1500' (450 metres) away.

A 25' (8m) RJ11 (thin, telephone-style) cable is included for each PC. Installation is as simple as plugging the "transmitter" unit into the printer port of your PC, the "receiver" unit into the printer and connecting them with the cables supplied. There's no way to make a mistake or a wrong connection.

Being parallel, there are no baud rates or parity to set. There is no software to run. No confusion. Just plug it in and start printing.

Use the **Data Link Distance Extender** if you'd like to direct-connect to a parallel printer a long way away, This consists of a Data Link transmitter for your PC, a receiver for your printer and 25' (8m) of cable. If you'd like to go further, we can supply you with inexpensive cable up to 450 metres long.

If a single printer is what you'd like to share ... and you'd like to do it automatically ... there's no quicker, easier or more economical solution than the Data Link system.

Share Wonder lets up to 36 PCs automatically share up to 6 printers with no software. Just dial the printer you want...



Share Wonder lets you share up to 6 printers between 36 PCs simultaneously! That means everyone in your office can get instant access to all your LaserJet, PostScript and dot-matrix printers.

The Share Wonder's modular concept allows you to start with just the the number you need for the PCs and printers you now have and never need to worry about expansion. Just add printer or PC Share Wonder modules as your needs grow. It's really that easy!

That lets everyone share all your printers ... all the time.

You can connect to a printer 300 metres away, through your parallel printer port, at a very fast 10,000 cps and using inexpensive telephone-style cable.

Share Wonder includes a simple 6-way selector to let you "dial" the printer you want, from your desk! Just turn the knob to select your printer. It even has lights to let you know if the printer is busy or out of paper ... to save time.

And installion is a snap, just like connecting a printer. Plug a "transmitter" into the printer port of each PC and a "receiver" into each printer. Then connect them with the cable (8m) supplied for each PC ... and start printing.

Need A Simple Data Switch?

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The Byteway is available in 4, 8 and 12 port configurations. The Bytelink comes with 24.

For straightforward fast printer sharing, the **Byteprint Turbo** allows 2, 4 or 8 PCs to share a parallel printer. 128K to 1Mb memory. Supports up to 30 metre cables.

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Gateway 2000 ties up with local supplier

By Helen Dancer

Gateway 2000, the US PC supplier which has enjoyed meteoric rises in popularity and profitability over the past five years, has made its first foray into Australia through Melbourne-based reseller Softrade.

Gateway 2000 made the decision that the Australian market's size meant that direct entry was not a viable option, so it chose instead to align itself with Softrade, more generally known in Australia as a business software provider.



Gateway's 2000 P5-60

"We're not going into the PC business in the way that someone like Dell has gone into it," said Softrade marketing manager Shahron Ameer. "The PC to us, and to most of our customers, is the icing on the cake; it is the shell inside which all the applications and business tools they need actually live and run. So we'll be looking at it from that perspective, not from the perspective of making money on selling boxes.

"The alliance with Gateway 2000 offers us considerable advantages, however, because all the PCs we're bringing in will be Pentium ready, and next year we'll be shipping Pentium machines from Gateway 2000. It is leading edge technology, which gives us the best leverage to provide our customers with better solutions."

Dell in Australia is unconcerned at the entry of the company which has caused it so much grief in the US. The companies currently run head-to-head, with Gateway successfully targeting the home hobbyist with money to spend on high-performance technology, and firm ideas about cost versus performance. "Gateway 2000 may have stood a better chance if it had come to the Australian market before Dell, but since we have been here over a year now, I expect it will find it hard to take a foothold in what is becoming a basically cluttered marketplace," said Dell's Australian marketing manager Denis Rowe. If the company had chosen to make a full-scale entry into Australia, Rowe said it might have made a difference. But since it is essentially sliding in via a distributor, it would be difficult to see how it expects to capture the psyche to the same extent.



Now available locally: the Gateway 2000 4DX2-66V



The Gateway 2000 Colour Book

Establishing a brand name requires a fistful of marketing dollars, he asserts, and it remains to be seen whether Gateway 2000 will be prepared to commit the resources in what will be basically a peripheral market.

"Minimal but interesting" is how IDC's Graham Penn described the impact Gateway 2000 would make in Australia. "It will serve to keep existing players honest," he affirmed, emphasising that what Gateway 2000 has to offer the market is leading edge technology at very competitive prices. "With Gateway in the marketplace, nobody will dare to offer old technology to customers.

So in a sense, it will keep all the players on their toes," he said.

For more information about Gateway 2000 PCs, call Softrade on 008 809 205.

1993 hit list

Top products capture the market

In the 1993 shakeout in the fierce competition to top the market, the following products showed their ability to capture mind and market share. These products were winners in their category:

- LX-400 Printer — Epson (DOS Systems, Printers and Monitors)
- MS-DOS 6.0 — Microsoft (DOS Communication, System Utilities)
- TurboMouse ADB (Macintosh) — Kensington (Macintosh Hardware)
- WordPerfect for Windows Education — WordPerfect (DOS Home Education, Recreation)
- Serial Mouse — Microsoft (DOS Drives, Modems, Connectivity)
- Access for Windows — Microsoft (DOS Business Applications)
- ClarisWorks (Macintosh) — Claris (Macintosh Software)

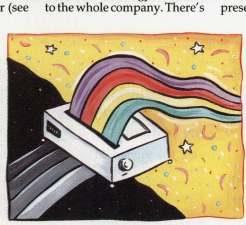
Runners up included Microsoft Golf, WordPerfect for Windows and the PowerBook Numeric Keypad from Kensigton

Input on output

By Nathaniel Tunbridge and Helen Dancer

The trend to lower priced, personal printing foreshadowed by Hewlett-Packard at the end of October (see *APC* November newsprint, Page 20) continues. Lexmark has followed suit with the introduction of two new desktop printers aimed at small businesses and home offices. The IBM ExecJet II 4076 is priced at $855 and offers 600 by 300dpi printing and scalable fonts at three pages per minute. Accompanying this is the $1761 4037 5E, that uses LED imaging technology to give it a maximum resolution of 1500 by 300dpi.

Addressing concerns about the loss of Australian intellectual property and input in the recent acquisition by Lexmark of Australian independent manufacturer, Gestetner Laser, president of Lexmark Asia Pacific, Peter O'Meara, commented; "The takeover has meant an increase in the level of technology available to the whole company. There's



a lot of open sharing — we have nightly exchanges of code zipping back and forth over the Pacific."

Epson also announced two new printers this month, using the announcement as a platform to celebrate the company's tenth anniversary in Australia. Epson's general sales manager, Gordon Groundwater, was keen to present Epson as being more than just the "dot-matrix people," unveiling a new inkjet printer, the Stylus 1000, the wide carriage version of the popular Stylus 800. The 1000 offers 360 by 360dpi and up to 300cps speed.

In keeping with tradition, however, Epson also released the LQ-150 dot matrix printer, the latest addition to the company's large 24-pin dot matrix range. It differs from its predecessor, the LQ-100, in that it is faster, quieter and can be upgraded to colour. Also released was the LQ-150, which is expected to retail for $552. The Stylus 1000 will sell for $1036.

Colour is proving an important direction for printing, at both ends of the business spectrum, with Fuji Xerox presenting its new strategy in Sydney at around the same time. Fuji Xerox's reading of the market is that the convergence of technology types and traditional office equipment, combined with the expectation of colour output which matches the vivid colour on the average PC screen, will see a network-capable fusion of printer and photocopier technology as the next giant leap in document management.

Colour sells, according to managing director David Stringfellow, and colour is a valuable communicator distinguishing information types and highlighting priorities on the page. Networked colour printing is yet to address the issues of bandwidth at the desktop, to enable the network to manage the transfer of such large volumes of data. But colour on demand is certainly still an attractive proposition. ✍

Fax me a roast chicken!

Technology at its delicious best

By Helen Dancer

FoodFAX is a new service in Sydney for both dedicated foodies and restauranteurs from Sydney-based Fax Back Systems. Restaurants post their menus and information about licensing, credit cards and opening hours on the retrieval system and subscribers dial-in and select the postcode to indicate restaurants in a given area and the fax number they wish the information to be sent to.

Subscription to the service will cost restaurants around $12 per month, and already 3417 restaurants have loaded their information onto the system.

There is no cost to foodies



other than the cost of the phone call. FoodFAX is the latest in a series of fax back services from Fax Back Systems, on a wide range of information including travel, real estate and government information.

For more details, contact Fax Back Systems, (02) 901

From Santa's sack . . .

Bargains abound for Christmas; software vendors are feeling a little ho, ho, ho, and if you want to put Christmas cheer into your PC, here are a few excellent offers:

- WordPerfect is offering customers who purchase WordPerfect 6.0 for Windows a copy of WordPerfect Presentations 2.0 for Windows for $189. This offer lasts until the end of the year. Contact WordPerfect Pacific on (02) 415 5222.
- Micrografx has reduced the price of its Graphics Works for Windows. The product is a suite of five graphics programs; PhotoMagic, WindowsDraw, Windows OrgChart, WinChart and SlideShow, integrated into one bundle, with a single installation process. Also included is a CD-ROM disk library of clipart and photo images. The new pricing for the package is $245. Contact Micrografx Australia on (02) 415 2642
- PCWARE is offering special deals on Trio DataFax Windows fax software on the purchase of a modem. Buying any of the following modems — Biztel, Comma, Diamond Technology, Maestro, MDFax, Microfax — from participating retailers, will entitle the buyer to also purchase DataFax for $79 (rrp $249). PCWARE is also offering an upgrade to DataFax from any other fax software for $89. Both offers run until Christmas Day. Contact PCWARE on (02) 252 3546.
- Merisel is offering a swag of Microsoft products for Christmas, from games to multimedia packages to software for the home office, such as Microsoft Works, Pulisher for Windows and Money for Windows. Contact Merisel on 008 25 1076.

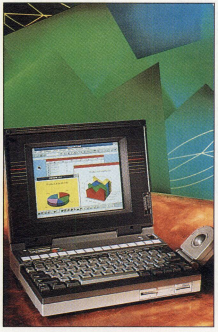
New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

NEW

TI's new colour notebook: Passively impressive

Texas Instruments has released the TravelMate 486SX/25 colour notebook. The machine weighs less than 2.8kgs and displays 256 colours simultaneously at VGA resolution.



The screen is based on new, passive-colour technology which features improved filters, smaller pixels and improved contrast ratios. The refresh rate is almost twice as fast as traditional passive screens at 150ms. TI claims that the screen delivers colour output virtually equal to the far more expensive, active-matrix displays.

The $5188 notebook comes with MS-DOS 6.0 and Windows 3.1 pre-installed on the 120M hard disk. For further information, contact Texas Instruments on (02) 910 3100.

IMPROVED

dBASE Compiler 2.0 offers 32-bit support

Borland has announced the release of dBASE Compiler 2.0 for DOS. The product allows users to compile and distribute applications developed in dBASE and provides 32-bit support. According to Ross Dembecki from Borland, applications compiled by the new compiler are twice as fast as applications built with dBASE IV 2.0 or the dBASE Compiler 1.0, and are up to 20 per cent faster than dBASE IV 1.X or dBASE III Plus.

Besides an increase in speed, the new features of the compiler include an intuitive, menu-driven interface, Autolink and Auto-Compile commands, date and time stamps, and access to up to 4G of memory through the Virtual Memory Manager.

The dBASE Compiler 2.0 for DOS costs $795. For users of dBASE Compiler 1.0 there is an upgrade price of $195.

For more details, contact Borland Australia on (02) 911 1000.

IMPROVED

NEC PowerMate 486es: How green is my computer

NEC has announced its release of the PowerMate 486es Series, the second generation of economical PowerMate PCs for the general business user. Suitable for the office or as a standalone machine, the series consists of three models — the PowerMate 425es based on the Intel 486SX, the PowerMate 433es based on the Intel 486DX, and the PowerMate 466es which uses the Intel 486DX2 microprocessor.



The 486es Series complies with the US Environmental Protection Agency's (EPA) Energy Star initiative. It incorporates integrated power management capabilities including a 'sleep' feature that powers the PC down to less than 30 watts when inactive. Other new features include accelerated local bus video technology and second-level cache.

All systems include 1M of video memory, 4M of RAM expandable to 32M, three expansion slots, three device bays, pre-installed MS-DOS 6.0 and Windows 3.1, mouse and IDE hard drive options. The 425es costs $3196, the 433es $3902 and the 466es $4807. The pricing includes a 170M hard disk.

For more information, contact NEC Information Systems on (02) 930 2000.

NEW

Acer lifts lid on new notebook products: piece by piece

Acer has announced the release of a whole swag of new products including modular notebooks, multimedia PCs, servers and workstations designed for the Windows NT platform.

The AcerNote series of notebooks features a modular design which will allow the user to upgrade and incorporate new technology as it becomes available. Memory, communications options, pointing device, battery pack, display, hard disk, keyboard and BIOS can be easily upgraded. The AcerNote 750 features an i486SL 25MHz processor and PCMCIA Type III slot. Prices start at $3868. Also in the series are the AcerNote 730 (pricing from $3214) and the AcerAnyWare U386s (pricing from $2415).

. . . and announces new multimedia PC

Acer has also released the AcerPAC 450+, a 486-based multimedia PC using Acer's ChipUp technology, which allows upgrades to more powerful CPUs in the future.

The AcerPAC 450+ features integrated communications and media capabilities including fax/modem, telephone and answering machine, CD-ROM and stereo sound. It also includes an online systems manual and three spare slots for further expansion.

The AcerPAC 450+ costs $5153 for the base model. For further information on Acer products, contact Acer Computers Australia on (02) 418 8044.

NEW

A light and sound show the hard disk way

With the demand for higher quality digital audio/video production growing, Micropolis has announced the release of the 2200 AV Series of 3.5in disk drives. The drives are specifically



designed for the multimedia market and do not replace the standard hard disk in computer applications.

According to Steve Lamb from Micropolis, "The 2200 AV series is designed for high-speed graphics and audio applications and may not perform to optimum levels with more conventional uses such as word processing or database."

Micropolis claims the new drives will resolve disk-related performance problems by reading data in long sequential blocks, providing sustained and continuous transfer of information. The new drives feature a new thermal calibration system which allows the completion of data transfer prior to thermal analysis calibration. The drives also feature cache management capabilities.

The 2200 AV Series includes a 1.05G drive which costs $1887 and a 1.75G drive which costs $2424. The price may vary depending on the Micropolis distributor.

For further information, contact Micropolis on (02) 959 2326.

IMPROVED

QikDraw for Windows: Australian-developed software for CAD users

QikDraw Systems has announced the release of QikDraw Micro V4.0 for Windows, a CAD package which offers major productivity enhancements over the DOS version by adding the functionality of the Windows graphical user environment.

Major enhancements of the product include full support for the Windows GUI, WYSIWYG display, cut and paste into other Windows programs, unlimited do/undo functions, online help and iconised tool bars.

The package costs $750 for a single-user licence. An upgrade from QikDraw Micro V3.22 for DOS costs $499. An education site licence is also available and is priced at $499 per copy. Contact QikDraw Systems on (08) 231 1888 for further details.

IMPROVED

Start where you stopped: IBM redesigns PS/1

IBM has announced a new line of PS/1 computers suitable for small business, home office and home users. Incorporating the IBM-patented Rapid Resume feature and Smart Energy System energy-saving technology, the PS/1 line has been designed to allow the user to run Windows applications easier.



The Rapid Resume feature will automatically return the user to the exact spot in the application the user left when the machine is turned on. It eliminates the need to re-open Windows applications.

There are four new models, ranging from an i486SX/25MHz to a i486DX2/33 or 66MHz system. All systems come standard with a SVGA display, 4M of memory expandable to 32 or 64M, preloaded MS-DOS 6.0, Windows 3.1 and Microsoft Works for Windows. Hard disk sizes range from 129M to 250M. In addition, all models include three PS/1 software products: PS/1 Fitness, which includes a virus checker, PS/1 Index and PS/1 Tutorial. All PS/1 computers are also covered by a 24-hour helpline and 12-month warranty.

The computers are available from large retailers including Harvey Norman, Brashes, Myer/Grace Bros, Dick Smith Electronics and Vox. Prices start from $2699.

For further information contact IBM on 008 815 154.

IMPROVED

Software turns printers into plotters

Insight Development Corporation has released an upgrade to PrintAPlot 3.0. PrintAPlot 3.04 includes support for HPGL/2, ADI drivers for more than 1200 printers inside AutoCAD and an onscreen plot preview feature. It features continuous plots, adjustable scaling and rotation and can handle multiple paper sizes.

PrintAPlot 3.04 works with AutoCAD, MicroStation, CADKEY and most other CAD applications. Users can run the program as a TSR, a DOS application under Windows or a stand-alone application.

PrintAPlot 3.04 costs $270. For more details, contact Technical Imports Australia on (02) 894 6102.

NEW

The Professor provides a warm feeling for new users

New PC users now have an alternative training method of learning Windows and DOS with the release of Professor Windows and Professor DOS from Individual Software.

The Professor series



provides a self-paced training method which allows control over the speed of progress. Menus allow immediate access to training topics which may be skipped or reviewed.

Individual copies of Professor Windows and Professor DOS cost $76 each. Network versions for both titles are available for $698.

The Professor series is available from CybaSystems, which can be contacted on (02) 875 4181.

NEW

Discis Books: No throwaway learning programs

Captain CD ROM has recently gained the distribution rights to Discis Books, a range of interactive CD-ROM-based books incorporating narration, music, sound effects, reading and learning software from Discis Knowledge Research.

Captain CD ROM is distributing 12 titles in the range which markets under the trademark of Kids Can Read! Most titles are available on multiformat CD-ROM and are priced from $49.95 per title.

For further information, contact Captain CD ROM on (03) 859 9554.

NEW

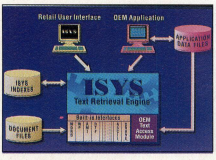
ISYS text retrieval engine available to developers

Odyssey Development has released a software developers' kit for developers and OEMs. The kit will allow developers to include text indexing and retrieval technology in their own applications.

The ISYS engine is available under Windows and DOS and is callable from all major languages. Sample code is provided for C, Pascal and Visual Basic.

Priced on application, the engine is purchased for an up-front charge covering the development kit and programmer-level support. There are also per-copy license fees.

For further information, contact Odyssey Development on (02) 965 7250.



NEW

64-bit graphics adaptor makes an impression

Matrox has announced the release of the 64-bit graphics adaptor, the MGA Impression. With twice the bandwidth of existing 32-bit adaptors, the expanded path increases the speed of information transfer to provide enhanced speed, resolution and colour quality.



The Impression has standard resolutions of 1280 by 1024 in 256 colours, 1152 by 882 in 32,768 colours and 1024 by 768 in 16.7 million colours, with its standard memory of 3M. The 4M Impression can achieve 1280-by-1024 resolution in 16.7 million colours. Special Windows drivers are included.

A multimedia option, the Matrox Marvel, used in conjunction with the Impression, allows broadcast quality 24-bit video to be played and manipulated on the PC.

The MGA Impression costs $2646 and is distributed in Australia by TCG.

For more details, contact TCG on (02) 699 8300.

NEW

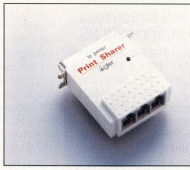
Print sharing without LANs

If sharing a printer is the reason for installing a LAN, then there is a low-cost alternative available. Print sharers have been around for a long time and provide a connection to a common printer from multiple PCs.

The Agiler Print Sharer, distributed in Australia by Protege Solutions, consists of smart connectors that attach to the PC parallel port and printer. It requires no external power supply and is compatible with all common operating systems and software applications, including Windows. The Agiler Print Sharer can hook up machines from up to a distance of 400 metres and can expand to accomodate 40 PCs.

Prices start at $199 for the starter kit, which allows connection of two PCs to one printer.

For further information contact Protege Solutions on (03) 558 9198.



NEW

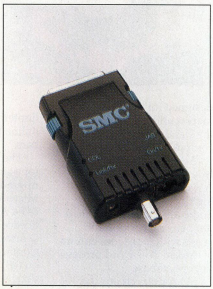
SMC enters portable connectivity market

Standard Microsystems Corporation has entered the expandable portable connectivity market with the release of the SMC ElitePort, a parallel port Ethernet adaptor.

The product is targeted at mobile PC users who have LAN connectivity requirements but cannot accomodate a conventional internal adaptor. It has dual connectors which allow connection to either 10BaseT or coax cabling and has driver support for NetWare IPX, NetWare DOS ODI, NetWare OS/2 ODI, DOS NDIS and OS/2 NDIS.

The ElitePort has a recommended retail price of $555, although this may vary depending on the distributor.

For more details contact SMC on (02) 238 2206.



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Retailers, not propeller heads

BY HELEN DANCER



The axiom that everything is bigger and better in America is about to change with the introduction of the first Harvey Norman Computer SuperStore at the company's head office store in Auburn, NSW.

Although the store, previewed in October *PC Super Market* offers, staff believe, the widest range of merchandise currently available under one roof, that's not the only attraction, according to Harvey Norman boss Gerry Harvey. This year's Retailer of the Year, Harvey has the retail gift and an almost inarticulable knack of knowing the market and what it wants to buy.

"People can come in here and not talk to a single salesperson, if that's what they want," he asserts. "The merchandise is all laid out, with banners highlighting the different sections; hardware, software and so on, and within those categories the different brands we stock. You can do a Woolies if you want to, grab a trolley and fill it with some of this and some of that, because you know exactly what it is you want."

Conversely, he says, the store is also catering for the 'Mums 'n Dads' approach, and people who don't know a hard disk from a CD-ROM will also find that the SuperStore dispenses good advice and information in equal proportion to its product choices. "We have 20 staff on the floor, each with an area of specialisation, and all capable of dealing comprehensively with questions that relate to their particular area. The important distinction here is that they are retailers who have been trained in technology, not propeller heads who have been told to get out there and sell."

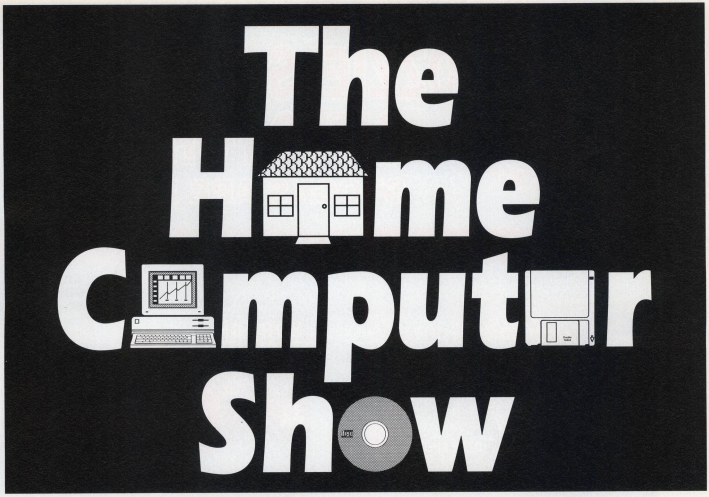
The rationale for the SuperStore is to encourage customers at all levels, from network and MIS managers to the home computer and recreational PC users, to regard the venue as a one-stop technology shop. To this end, the SuperStore stocks a full range of Apple, IBM and Compaq models, and several other brand types. The emphasis is on quality, Harvey maintains. "In our regular stores we have had a bit of trouble selling the brands nobody has ever heard of, on the basis that in a year or so, nobody will remember what became of them. So we're going with established brands, because of the quality, and also the customer security factor".

The Harvey Norman name stands the venture in good stead in this regard. When it was suggested to him that the entry of Dell and other direct selling companies into the marketplace had hurt the prospects for retail, Harvey's face lit up in a large and genuine laugh. "Of the two of us, I'd be more worried to be a Mr Dell than a Mr Harvey Norman. People in Australia know the name Harvey Norman. They know we're going to be here next year and the one after that, and right here they can see exactly what they are getting. Even if the customer has heard of, say, Dell, is the real consumer end of the market ready to buy over the phone something they have never seen? Direct buying can't even offer any price advantages over us, because of the range and the volume purchasing power we have here, and can pass on to larger orders."

Not simply a PC store, however, the Harvey Norman Computer SuperStore will be the first to offer academic versions of software and direct over-the-counter software upgrades. The store has undertaken complicated arrangements with the vendors to accept disks and provide upgrades, and to return the disks to the software provider. "What this means is that the customer gets the new software on demand, and in stock, with no waiting," said Frank Robinson, manager of the first SuperStore, and creator of the Harvey Norman SuperStore concept.

Both men agree that it is an idea whose time has come. It represents a new era in retailing in Australia, where a start up business can go into one store and buy all its hardware, software, printer and peripherals, desks, chairs, fax machine and shredder, as well as an answering machine for the office and a mobile phone for the road. Harvey Norman has agreements with both Telecom and Optus, and will arrange on the spot connection to either, on its comprehensive range of hand-held and mobile phones.

From the beginning of the new year, Harvey Norman will also offer a full networking advisory service, with Novell Certified Engineers on the premises. The implications as a provider for the burgeoning field of systems integration are enormous. One suspects that this concept comes as no surprise to Harvey, whose retail savvy will have taken full account of his potential customer base, whether the end consumer, or another link in the value chain. He concludes his tour of the store with the assertion that here, on the floor, "our aim is to be all things to all people."



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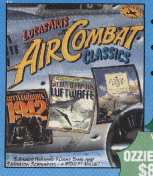
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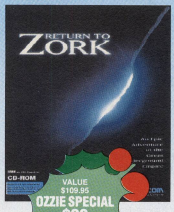
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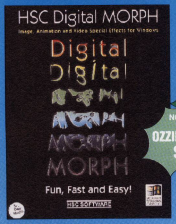
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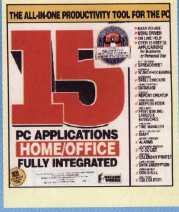
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Lantastic Adaptor Independent	Call
Lantastic 10 Base T Starter Kit	Call
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X-POST E-mail for Lanatastic	Call
Lantec Xmenu - Menu System for Novell	Call

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MS Classical Hollywood	$ 55
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Call us for upgrade & crossgrade options

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Diamond Stealth 24 pro	$ 730
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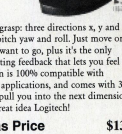
Lotus Organiser for Windows



Everybody can be better organised, sick of the piles of paper growing taller on your desk, ever forgot a deadline at the office, a dinner with your wife or husband, then if any of this sounds like you, you need Lotus Organiser. Lotus Organiser is a fully customisable personal information manager. It's the most enjoyable way to use your PC to manage your time and work, provides a full diary, to do list, planner, address book, notepad, and anniversary modules. Don't buy Dad or Mum a new diary for Xmas, buy Lotus Organiser.

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Logitech Cyberman - New Product, Hot!



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Creative Labs Multimedia Kits



Three great kits to choose from best prices available. Creative Labs the developer of Sound Blaster provides three value packed kits all of which we recommend.

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*buy*tech *would like to wish you a very merry Christmas. We would like to thank you for your continuous support of our business. And if we can be of any further assistance now or in the near future, please do not hesitate to contact us.*

Best Wishes.

*buy*tech is open 5 days a week from 8:30am to 6:00pm Monday to Friday

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EST. 1981

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- ★ Choice of Hard Disk Capacity
- ★ 640 x 480 VGA LCD
- ★ NiCad Rechargeable Battery Pack
- ★ 386SX33 Version also available
- ★ Complete with Carry Bag & AC Adapter

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PC Super Market Buyer's Protection Scheme

Buy With Confidence

Buying direct from magazine advertisers is becoming an increasingly popular way to purchase PC hardware and software. *PC Super Market* has been launched to provide a one-stop guide to the best products currently available at the best prices.

To protect our readers, we back all adverts appearing in *PC Super Market* with our 'Buyer's Protection Scheme'. The Scheme offers two great benefits:

1. The Payment Protection Plan — Where a supplier goes into liquidation after receiving your order and full payment, but before actually supplying the goods, we will reimburse to you the amount you have paid to the supplier in respect of that particular order; provided your order has been registered with us.

2. The Problem Clinic — If you encounter any problem with a product purchased through the Scheme within 12 months of the product order being registered with us (see below), and the supplier won't put things right, we will liaise with the supplier on your behalf to try to sort the problem out. This benefit is non-transferable and applies to the original registered purchaser only.

The Scheme applies to all orders placed with suppliers in direct response to an advertisement in *PC Super Market*. To register a purchase with the Scheme, simply order goods from the supplier in the normal way and then complete the *PC Super Market* Registration Form on Page 25. Give your personal details along with details of the purchase you wish to register. Post the form along with a self-addressed stamped envelope to us within seven days of ordering. The Scheme only protects orders placed within the cover month in which the advertisement for the specific product appeared (for example, the valid period for the December issue is until December 31).

What protection do you get?

The Payment Protection Plan

ACP Publishing Pty Ltd limits its responsibility under the Payment Protection Plan to:
(a) a maximum of $10,000 total payments to a registered party in respect of each advertiser;
(b) an aggregate maximum of $100,000 total payments in respect of all claims by a registered party during any year commencing July 1.

The Problem Clinic

If you encounter problems with a product, within 12 months of registration with us, we ask that you first give the supplier the opportunity to put things right. If you fail to get satisfaction from the supplier, the Problem Clinic will liaise with the supplier to try and resolve your problem. We cannot, however, give product support relevant to specific products. If you need assistance with a delivery problem, before contacting us please allow 28 days from the date on which you place your order to allow advertisers to cope with fluctuations in demand.

Claiming under the Scheme

(i) Before providing the benefits of the Scheme, we will require proof of full payment by you to the supplier.
(ii) Payment under the Payment Protection Plan will only be made after other liable parties (such as insurance and credit card companies) have met their liability to you in full.
(iii) Claims under the Payment Protection Plan must be made in writing in the prescribed form (available on request). Claims will only be met where the appropriate claims form is lodged with us within 30 days of the liquidation of the supplier. Claims forms must be sent or delivered to GPO Box 37, Sydney NSW 2001.
(iv) Payment under the Payment Protection Plan will not be made if the claimant is found to have an association or relationship with the advertiser or its directors who are the subject of the claim.

Ambit of the Scheme

PC Super Market's Buyers Protection Scheme is available only to parties resident or carrying on business in Australia.

Recovery by ACP Publishing Pty Ltd

ACP Publishing Pty Ltd reserves the right to seek recovery from a liquidated supplier of any sums paid to you under the Payment Protection Plan. All we ask is that you give us your full co-operation, including executing any formal documentation required.

Before Buying

1 Use the *PC Super Market* Buyer's Template on page 27 when ordering. This will ensure that both you and the supplier have all the information needed.

To Register

1 Fill out the *PC Super Market* Buyer's Protection Screen Registration Form on page 25. Make sure to fill out all details including the page the advertisement appeared.

2 Mail the completed Registration Form to *PC Super Market* together with a self-addressed envelope.

3 On receipt of your Registration Form we will issue you a reference number for that purchase. This will be mailed to you. You should keep this on file and be ready to quote it in case of enquiry.

Conditions

1 The order must be placed in direct response to an advertisement in *PC Super Market* only (i.e not from brochures or other promotional material sent in response to an enquiry). The order must be placed not later than the end of the cover month in which the advertisement appeared (for example, before December 31 for this issue).

2 Details of the order must be registered using the *PC Super Market* Buyer's Protection Scheme Registration Form on Page 25 not later than seven days after the order has been placed with the advertiser.

3 The Buyer's Protection Scheme applies only to *PC Super Market* advertisements. Advertisements appearing in other areas of *Australian Personal Computer* are not covered.

PC Super Market

In order to register your purchase under the Buyer's Protection Scheme, you must complete this coupon and return it to us no later than the end of the month of publication and also not later than 7 days after the placement of the order (ie: all coupons must be post-marked prior to December 31, 1993 for this issue).

BUYER'S PROTECTION SCHEME REGISTRATION FORM

SUPPLIER DETAILS

Name _____
Company _____
Address _____
_____
_____
Postcode _____
Telephone _____
Fax _____

CUSTOMER DETAILS Order Date _____

Name _____
Company _____
Address _____
_____
_____
Postcode _____
Telephone _____
Fax _____

These items were bought from an advertisement appearing in PC Super Market on page _____ of issue _____

Quantity	Detailed description of the items (for software include version number)	Unit cost	Total price

DELIVERY DETAILS

Method of delivery _____
Date of despatch _____ Date of delivery _____
Delivery address _____
_____
_____
_____ Postcode _____

SUB TOTAL	
DELIVERY	
PACKAGING	
SALES TAX	
GRAND TOTAL	

METHOD OF PAYMENT

Purchase Order · Cheque · Postal Order · Credit Card (Delete as applicable).

Credit card company _____ Credit card number [| | | | | | | | | | | | | | | |]

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PC Super Market

DECEMBER 1993

The PC Super Market Buyer's Advisory Service offers an independent guide to selecting PC hardware and software. Based on your needs, and drawing on a database of all available PC products, you will receive personalised, written advice on what sort of hardware and software to buy within 48 hours of receipt of this questionnaire. The service costs $25, and some advertisers may deduct that from the price of their goods.

Please indicate the tasks you need or would like to use your computer for.

Word processing YES NO
Use your computer to create letters and other documents. A word processor can also function as a simple database.

Financial calculation YES NO
The spreadsheet is a powerful tool in answering 'what if' questions. Spreadsheets can also help budget and plan finances.

Record keeping YES NO
Databases help keep track of information. Their power lies in their indexing capabilities.

Book keeping YES NO
Computerised accounts clear the paper mountain and make light work of small business management.

Entertainment YES NO
Games, games, games for the whole family.

Education YES NO
Educational software can complement school and is more exciting than textbooks.

Programming YES NO
Learning to program is challenging and can be rewarding.

Graphics YES NO
Become an electronic artist. The computer can produce marvellous effects, but you'll probably want a printer.

Computer aided design YES NO
The computer can be a valuable aid in drawing plans, designing products and creating line drawings.

Music YES NO
The computer can control a range of instruments, as well as automating manual composing.

Desktop publishing and presentation YES NO
The next step beyond word processing, where text meets pictures. DTP can also be used for business graphics.

Communications YES NO
With a modem, your computer can communicate to other computers, and download programs.

Have you ever used or owned a computer before? YES NO

If yes, please describe your experience

.....

.....

.....

Do you want to run several tasks at once? YES NO
Normally you would load programs as you need them.

What is the maximum you can afford to spend? $ .....

Do you want that amount to include software? YES NO

Do you want that amount to include peripherals? YES NO

Would you prefer a 'name' brand? YES NO

Would you prefer an Australian-made computer? YES NO

Is portability an important factor? YES NO

Will this computer be part of a network? YES NO

If not, will you share information with other users? YES NO

Any other information you would like considered.

.....

.....

.....

.....

Mr/Mrs/Ms .....

Address .....

.....

Suburb ..... State .. Postcode .....

I agree that your advise is given without legal liability for any consequences arising therefrom.

(signature)

Send your completed form to *PC Super Market* Buyer's Advisory Service, PO Box 37, Sydney 2001 with a cheque for $25 made payable to Point Partners.

PC Super Market

Make ordering computer equipment and software easier and safer by using the specially designed *PC Super Market* Buyer's Template. Simply fill in the details of your system and the goods you intend to purchase. Send the form to the supplier to get written confirmation of availability, pricing, compatibility with your PC system, delivery and returns arrangements. Don't forget to register your purchase under the ACP Publishing Pty Ltd Buyer's Protection Scheme. (See page 25)

BUYER'S TEMPLATE

SUPPLIER DETAILS

Name _____
Company _____
Address _____
_____
_____
_____
_____
Postcode _____
Telephone _____
Fax _____

CUSTOMER DETAILS

Name _____
Company _____
Address _____
_____
_____
_____
_____
Postcode _____
Telephone _____
Fax _____

ORDER DETAILS

New order _____
Telephone confirmation _____
Mailed _____
Faxed _____
Name of salesperson _____
Date of order _____
Order number _____

Quantity	Detailed description of the items	Unit cost	Total price

SUB TOTAL	
DELIVERY	
PACKAGING	
SALES TAX	
GRAND TOTAL	

DELIVERY DETAILS

Method of delivery _____
Date of despatch _____ Date of delivery _____
Delivery address _____
_____
_____ Postcode _____

SYSTEM COMPATIBILITY

My current system consists of the following:
Hardware _____
_____
Software _____
_____
Peripherals _____
_____
Please state details of your return policy, money back and warranty arrangements:
_____
_____
We confirm that the item(s) ordered is (are) compatible with the customer's current systems described above.

Supplier's signature _____

METHOD OF PAYMENT

Purchase Order • Cheque • Postal Order • Credit Card (Delete as applicable).

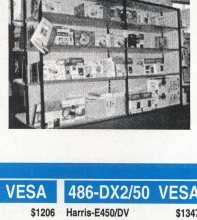
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The *VESA Local-Bus has become the major bus* because of it's much higher 32bit performance for graphics & hard disk I/O, and because it still resides along with ISA or EISA slots in the PC. We suggest that you don't buy a Local-bus PC unless it is to the VESA standard (ask our competitors if theirs is VESA!).

HARRIS EPOCH - ISA & VESA SYSTEMS

386-DX40 ISA

Harris-E340/DI $727
- Minitower, Desktop or Slimline
- i80386-DX 40MHz processor
- 8x Isa 16 bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game
- IDE Hard Disk controller

4Mb Ram (Max 32Mb) 396
101Keyboard, Tactile 49
Trident Graphics 512K 79
Conner 85Mb IDE Hdd 349
Tystar SVGA 14" Monitor 460
MS-Dos 6.0 85
Hi-Res mouse 23

$1877ex $2168inc

486-SX25 ISA

Harris-E425/SI $719
- Minitower or Desktop
- i80486-SX 25MHz processor
- 128K processor Cache
- 8x Isa 16 bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game
- IDE Hard Disk controller

4Mb Ram (Max 32Mb) 396
101Keyboard, Tactile 49
Trident Graphics 1Mb 115
Conner 85Mb IDE Hdd 349
Tystar SVGA 14" Monitor 460
MS-Dos 6.0 85
Hi-Res mouse 23

$1899ex $2196inc

486-SX33 VESA

Harris-E433/SV $892
- Minitower or Desktop
- i80486SX 33MHz processor
- 256K processor Cache
- 2x Vesa 32bit, 6x Isa 16bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game
- IDE Hard Disk controller

4Mb Ram (Max 32Mb) 396
101Keyboard, Tactile 49
Actix Prostar VL Graphics 261
Conner 125Mb IDE Hdd 360
Tystar SVGA 14" Monitor 460
MS-Dos 6.0 85
Hi-Res mouse 23

$2181ex $2526inc

486-DX33 VESA

Harris-E433/DV $1206
- Minitower or Desktop
- i80486-DX 33MHz processor
- 256K processor Cache
- 2x Vesa 32bit, 6x Isa 16bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game
- IDE Hard Disk controller

4Mb Ram (Max 32Mb) 396
101Keyboard, Tactile 49
Actix Prostar VL Graphics 261
Conner 125Mb IDE Hdd 360
Tystar SVGA 14" Monitor 460
MS-Dos 6.0 85
Hi-Res mouse 23

$2451ex $2840inc

486-DX2/50 VESA

Harris-E450/DV $1347
- Minitower or Desktop
- i80486-DX2/50 MHz processor
- 256K processor Cache
- 2x Vesa 32bit, 6x Isa 16bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game
- IDE Hard Disk controller

4Mb Ram (Max 32Mb) 396
101Keyboard, Tactile 49
Actix Prostar VL Graphics 261
Conner 125Mb IDE Hdd 360
Tystar SVGA 14" Monitor 460
MS-Dos 6.0 85
Hi-Res mouse 23

$2573ex $2981inc

HARRIS EPOCH - VESA SYSTEMS

486-DX2/66 VESA

Harris-P466/DV $1706
- Minitower or Desktop
- i80486-SX33 MHz w/ 256 cache
- 256K processor Cache
- 2x Vesa 32bit, 6x Isa 16bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game

4Mb Ram (Max 32Mb) 396
101Keyboard, Tactile 49
Actix Prostar VL Graphics 261
Conner 125Mb IDE Hdd 360
Tystar SVGA 14" Monitor 460
MS-Dos 6.0 85
Hi-Res mouse 23

$2881ex $3340inc

486-DX33 VESA+

Harris-P433/DV $1206
- Minitower or Desktop
- i80486DX 33MHz processor
- 256K processor Cache
- 2x Vesa 32bit, 6x Isa 16bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game

4Mb Ram (Max 32Mb) 396
101Keyboard, Tactile 99
Diamond Vesa Stealth 1Mb 378
Vesa IDE Controller 126
W/Digital 170Mb Hdd 13ms 398
Magtron SVGA 1024X768 519
MS-Dos 6.0 85
Hi-Res mouse 23

$2786ex $3230inc

486-DX2/50 V+

Harris-H450/DV $1347
- Minitower or Desktop
- i80486DX 50MHz processor
- 256K processor Cache
- 2x Vesa32bit, 6x Isa 16bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game

4Mb Ram (Max 32Mb) 396
101Keyboard, Tactile 99
Diamond Vesa Stealth 1Mb 378
Vesa IDE Controller 126
W/Digital 170Mb Hdd 13ms 398
Magtron SVGA 1024X768 519
MS-Dos 6.0 85
Hi-Res mouse 23

$2908ex $3371inc

486-DX2/66 V+

Harris-H466/DV $1706
- Minitower or Desktop
- i80486DX /2 66MHz processor
- 256K processor Cache
- 2x Vesa 32bit, 6x Isa 16bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game

4Mb Ram (Max 32Mb) 396
101Keyboard, Tactile 99
Diamond Vesa Stealth 1Mb 378
Vesa IDE Controller 126
W/Digital 170Mb Hdd 13ms 398
Magtron SVGA 1024X768 519
MS-Dos 6.0 85
Hi-Res mouse 23

$3216ex $3730inc

MultiMedia, 16 bit sound

486-SX25 Multi M.

Harris-E425/SI/MM $719
- Minitower or Desktop
- i80486-SX25 MHz w/ 128 cache
- 8x ISA 16bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game
- IDE Hard Disk Controller

4Mb Ram (Max 32Mb) 396
M/media kit w 4 CD's 740
AT Buss IDE controller 95
101Keyboard, Tactile 49
Trident Graphics 512Kb 79
Conner 85Mb IDE Hdd 341
Tystar SVGA 14" Monitor 460
Dos 6.0 + Hi Res mouse 108

$2595ex $2995inc

Peripheral Prices & System Options: Configure Your Own System!

Keyboard/Mouses

101 Keyboard, Tactile **$49**
Honeywell 101 Keyboard, Tactile 99
Keyboard w Cherry Keyswitch 126
Hi-Res mouse 23
Logitech First Mouse 50
Logitech Serial Mouse & PS/2 93
Logitech Bus Mouse 99
Microsoft Serial Mouse & PS/2 99
Microsoft Serial Mouse, 5 Pack 473
Microsoft Bus Mouse 125
Logitech Portable Trackball 144
Logitech Desktop Trackman 127
Microsoft Ballpoint Mouse 170
Kurta Digitiser 12" x 12" 552

Graphics Cards

ISA

Trident TVGA9000C, 512K **$79**
Trident TVGA 8900C, 1Mb 115
Paradise West Digital, 1Mb 218
TsengIMegaEVA 2 1M 1024 x 768 243
Diamond Speedstar 1M 1024 x 768-814
Diamond Stealth 1 M 1024 x 768 381
D'mond Stealth Pro 2 M 1280 x 1024 725
ATI Ultra+ 2M 1024 x 768 483
ATI UltraPro 2M 1280 x 1024 734
Actix 1321M 1280 x 1024 374

VESA

D'mond Sp'dstar 1M Vlb 1024 x 768 261
Diamond Stealth 1M 1280 x 1024 472
D'mond St'lth Pro 2M 1280 x 1024 699
Diamond Viper 2M 1280 x 1024 831
Actix 32V1 1M S3 1280 x 1024 441
Actix 32V1 2M S3 1280 x 1024 599
Actix UVL 2M S3 1280 x 1024 892
Tseng Mega Eva 1M 1024 x 768 293
Tseng ET4000 W32 1M 1024 x 768 327
#9 GXE 1280x1024, Cad/Win, 1M 619

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NORTH SYDNEY

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File Servers & Workstations



Over the last eight years we have supplied many thousands of the HARRIS-Epoch systems. All components are chosen for quality & reliability, and all systems are QA tested. We have also supplied PC's for over 130 Networks, including to many well-known large organisations. Call us to discuss your requirements.

HARRIS - Network Workstations

386-DX40 ISA Diskless, Ethernet

- Minitower, Desktop or Slimline
- i80386-SX 33MHz processor
- 8x Isa 16 bit slots
- Ports: 2x Ser, Par Ptr, Game

Harris-H340/DI	**$727**
4Mb Ram (Max 32Mb)	396
Honeywell 101Keyboard	99
Trident Graphics 512K	79
Tystar SVGA 14" Monitor	460
MS-Dos 6.0	85
Hi-Res mouse	23
3COM Ethernet III, 16bit	251
Boot Rom for diskless	50
$1884ex	**$2170**

All 2 year warranty

486-SX25 ISA 85Mb HDd

- Minitower, Desktop or Slimline
- i80486-SX 25MHz processor
- 128K processor Cache
- 8x Isa 16 bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game
- IDE Hard Disk controller

Harris-H425/SI	**$719**
4Mb Ram (Max 32Mb)	396
Honeywell 101Keyboard	99
Trident Graphics 1Mb	115
Conner 85Mb IDE Hdd	349
Tystar SVGA 14" Monitor	460
MS-Dos 6.0	85
Hi-Res mouse	23
3COM Ethernet III, 16bit	251
$2157ex	**$2497**

486-DX33 VESA Mitac 15", 85Mb, 8Mb

- Minitower or Desktop
- i80486DX 33MHz processor
- 256K processor Cache
- Ram, Max 32Mb
- 2x **Vesa**32bit, 6x Isa 16bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game
- IDE Hard Disk controller

Harris-H433/DV	**$1116**
8Mb Ram	792
Honeywell 101Keyboard	99
Diamond Vesa Stealth 1Mb	378
Conner 85Mb IDE Hdd	349
Mitac 15" Monitor, .28	799
MS-Dos 6.0	85
Hi-Res mouse	23
$3137ex	**$3641**

HARRIS - CAD & DTP Systems

486-DX2/50 VESA Sony 17" Cache HD

- Minitower or Desktop
- i80486-DX 50MHz processor
- 256K processor Cache
- Ram, Max 64Mb
- 2x **Vesa**32bit, 6x Isa 16bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game

Harris-H450/DV	**$1347**
Vesa-Ide HDC/FDC Contr.	126
8 Mb Ram	792
Honeywell 101Keyboard	99
Diamond Vesa Stealth 1Mb	378
W/Digital 212Mb Hdd, 15ms	414
Sony 17" Monitor, .31	1990
MS-Dos 6.0	85
Hi-Res mouse	23
$4504ex	**$5254**

486-DX2/66 VESA Sony 17" Cache HD

- Minitower or Desktop
- i80486-DX 66MHz processor
- 256K processor Cache
- Ram, Max 64Mb
- 2x **Vesa**32bit, 6x Isa 16bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game

Harris-H466/DV	**$1706**
Vesa-Ide HDC/FDC Contr.	126
8Mb Ram	792
Honeywell 101Keyboard	99
Diamond Vesa Stealth 1Mb	378
W/Digital340Mb Hdd, 11m	565
Sony 17" Monitor, .31	1990
MS-Dos 6.0	85
Hi-Res mouse	23
$4940ex	**$5764**

HARRIS - FILE SERVERS

486-DX33 VESA 330Mb F/Scsi, 8Mb

- Floor standing Full Tower Unit
- i80486-DX 2/50MHz processor
- 256K processor Cache
- Ram, Max 32Mb
- 2 x Vesa 32 bit, 6 x Isa 16 bit
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game

Harris-H433F/VE	**1331**
8Mb Ram	792
Buslogic vesa/SCSI Cont.	598
Fujitsu 330Mb Hdd, F/Scsi	672
101Keyboard, Tactile	49
Trident Graphics 512K	79
Philips Mono VGA monitor	257
3COM Etherlink III, 16bit	251
$3484ex	**$4029**

486-DX2/66 EISA 330Mb, F/Scsi, 16Mb

- Floor standing Full Tower Unit
- i80486-DX 50MHz processor
- 256K processor Cache
- Ram, Max 32Mb
- 1x Vesa, 7 x Eisa 32 bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game

Harris-H460F/VE	**2762**
16Mb Ram	1428
Adaptec Eisa SCSI Cont.	1319
Fujitsu 330Mb Hdd, F/Scsi	672
101Keyboard, Tactile	49
Paradise Svga Accelerator	218
Acer S VGA Color monitor	519
3COM 32bit Eisa adapter	447
$6364ex	**$7414**

486-DX266 VESA/EISA 2x 1.7Gb, Duplex

- i80486DX 50MHz processor
- 256K processor Cache
- Ram, Max 32Mb
- 1x Vesa, 7 x Eisa 32 bit slots
- 1.44Mb 3.5" **Teac** FDD
- Ports: 2x Ser, Par Ptr, Game

Harris-H460/DV2	**$2191**
16Mb Ram	1428
Buslogic Vesa/Scsi Hdc	598
101Keyboard, Tactile	49
Trident Svga 512K	79
2x Fujitsu 1.7Gb Hdd	7144
Philips VGA 14" Monitor	257
Double Width Tower	1044
SMC Elite 32bit Ethernet	1291
$12110ex	**$14081**

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Conner 84Mb, <17ms	349
Conner 125Mb, <19ms	360
Conner 170Mb, 17ms	398
Conner 250Mb, 14ms	495
Conner 340Mb, 12ms	645
Conner 540Mb, 12ms	1232
Western Digital 170Mb, 13ms	398
Western Digital 212Mb, 15ms	414
Western Digital 250Mb, 15ms	450
Western Digital 340Mb, 11ms	565
Western Digital 424Mb, 11ms	781

SCSI - 2 Year Warranty

Conner 170Mb, 17ms Scsi	422
Conner 212Mb, 12ms Scsi	528
Conner 340Mb, 12ms Scsi	677
Conner 540Mb, 12ms Scsi	1320
Conner 1.37Gb, 10ms Scsi	2095

IDE - 5 Year Warranty

Fujitsu 330Mb, 12ms	672
Fujitsu 520Mb, 12ms	1337

See Warranty Prev. Page

Hard Disks

Fujitsu

SCSI - 5 Year Warranty

Fujitsu 330Mb, 12ms, F/ Scsi	672
Fujitsu 520Mb, 12ms, F/Scsi	1337
Fujitsu 1.1Gb, 10ms	1957
Fujitsu 1.7Gb, 11ms	3572

Colour Monitors

Tystar 14" 1024x768 .28 I	460
Acer 33D 14" 1024x768 .28 I	519
Mitac 15" 1024x768 .28 NI LE	799
Mitac 17" 1024 x768.26 NI LE	1686
Sony 14" 1024x768 .25 NI	979
Sony 17" 1024x768 .25 NI	1990

Fully Digital:

Sony 17" 1024x768 .25 NI	2298
Sony 20" 1024x768 .25 NI	5189

NEC Monitors call for best prices...

RAM

1Mb Simms 70nsec Jap/Usa	99
4Mb Simms 70nsec Jap/Usa	344

RAM prices subject to change

Hard Disk & I/O Controllers

IDE Controller: ISA

AT Buss Paddleboard FDD/HDD	64

IDE-VESA 32 bit

Vesa with serial, parallel	126
Promise Vesa, Cache 0-16Mb	300

SCSI Controllers: ISA

Adaptec AHA-1542CX Kit	554
UltraStor 14F Hdc/Fdc F/Scsi	514
Buslogic Fast SCSI	490
Promise SCSI Cache controller	604

SCSI-VESA 32 bit

Ultrastor 34F Vesa F/SCSI	598
Buslogic BT-445S Vesa F/SCSI	598

EISA Controller

Adaptec 2742 SCSI-EISA	998

Note: Above are Component prices. Only avail. when purchased with systems.

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Windows?

Add-on cost for above Harris systems:

Windows 3.1	**$85**
Windows-F-Worksgroups	**$119**

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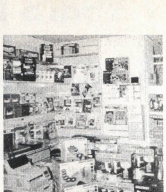
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Word Processing

MS Word-For-Windows	489
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Lotus 123 ver 2.4 - Dos	525
Lotus 123 ver 3.4 - Dos	575
Lotus 123 ver 4.0 - Win	498
Excel 4.0 F Windows	499

CAD Systems

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We can supply Microsoft Windows NT Servers, workstations and entire networks...

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Microsoft Windows NT Adv. Server	2250
Novell Netware 2.2, 5 user	940
Novell Netware 2.2, 10 user	2095
Novell Netware 2.2, 50 user	4196
Novell Netware 2.2, 100 user	6297
Novell Netware 3.12, 5 user	1198
Novell Netware 3.12, 10 user	2595
Novell Netware 3.12, 25 user	4051
Novell Netware 3.12, 50 user	5462
Novell Netware 3.12, 100 user	7647
Novell Netware 4.01, 5user CD	1487
Novell Netware 4.01, 10user CD	3583
Novell Netware 4.01, 25user CD	5261
Novell Netware 4.01, 50user CD	6741
Novell Netware 4.01, 100user CD	9358

Also phone for NETWARE UPGRADES

Graphics

Corel Draw ver 3.0 w CD	249
Corel Draw ver 4.0 w CD's	622
Aldus IntelliDraw	240
MicroGrafx Designer V4.0	592
TurboCAD V3 for Dos/V1 for Win	199
TurboCAD Pro for Windows	275

Utilities

Norton Utilities V7.0	199
Norton Desktop Win or DOS	199
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SuperStor Pro disk compression	179
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Desktop Publishing

Adobe PhotoShop for Windows	925
MicroGrafx Picture Publisher	574
Pagemaker 5.0	996
Microsoft Publisher f win	179

Integrated

Lotus Smartsuite	760
Microsoft Office	740
Microsoft Office Pro - Inc. Access	844
Microsoft Works - DOS	167
Microsoft Works-F-Windows	199
Lotus Works	199

Presentation

Lotus Freelance-For-Win	499
Microsoft Powerpoint	499
Persuasion F Win	524

System Software

Dos 6.0 Upgrade	99
OS/2 ver 2.0	213
Windows 3.1	149
Windows for Workgroups	163

Network Hardware

ADAPTERS	
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SMC Ethercard 16bit, 10-T	218
Intel EtherExpress 16bit coax	229
Intel EtherExpress 16b, 5 pck	1094
3Com Etherlink II 8 bit coax	346
3Com Etherlink III 16 bit coax	251
3Com Etherlink III 16 bit 10-T	251
D-Link PCMCIA-2 Ether Adap, coax	499
D-Link PCMCIA-2 Ether Adap, 10-T	499
10BASE-T HUBS/Concentrators	
SMC 8+1 ports	793
SMC 12+2 port s	1705
Intel 12 port f Netware 3.11	1031

Misc. Software

ABC Flowcharter for Win	495
ACCPAC Simply Accounting f Win	228
Aldus Freehand	695
ACT for Windows	598
Adobe type on call CD-ROM	110
Adobe type manager f Win	139
Adobe plus 22 font pack	291
After Dark Star Trek scr saver f Win	78
Bitstream Facelift f Win	135
Bitstream Facelift f W.Perf.	135
Borland Turbo C++ DOS	137
Borland Turbo C++ Win	229
Borland Office	742
Borland Turbo Pascal Dos	214

Misc. Software

Borland Turbo Pascal Win	258
Carbon Copy Plus	248
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Claris Works for Dos	217
Close-up Cust & Supp	242
ClickArt - Various subjects	83
Crosstalk Mk 4	247
Crosstalk f Win	223

Software all latest versions, if not, we'll replace it! All obtained via Australian distributors - so you can obtain support and upgrades.

DBase 4 V2.0	557
DAC Easy Accounting	360
Desqview 386 inc QEMM	241
Fastlynx PC - PC Transfer	189
Foxpro V2.5 Dos database	576
Foxpro-F-Windows V2.5	576
Grammatik - Dos	172
Grammatik - Win	188
Idea Fisher	253
ISYS hypertext search Dos	424
ISYS hypertext search Win	424
Laplink file transfer V5.0	190
Lotus for OS/2	529
Lotus Organiser-F-Win	155
Lotus Improv	165
Microsoft Access 1.1	498
Microsoft Excel f Win	499
Microsoft Flight simulator V5.0	80
Sydney IFR Project for Flight Sim	74
Microsoft Money f Win	59
Microsoft Office f Win	740
Microsoft Project f Win	740
Microsoft Powerpoint Pres.	499
Microsoft True Type 44 fonts	95
Norton Anti-Virus	165
Omnipage OCR Profes.	1453
Org Chart f Win	146
Paradox-F-Win (special)	271
Paradox, Dos	860
PC Anywhere f Win Host & Remote	230
Printcache spooler f Win	169
Print-It, plotter SWare for printers	295
Q & A Database	398
TypeQuick	93
Winfax Pro fax software	199

Compilers

Microsoft Cobol compiler	998
Microsoft Fortran compiler	189
Microsoft Pascal compiler	411
Microsoft Quick C Compiler Win	249
Microsoft Visual Basic 3.0 Win	245
Microsoft Visual Basic Pro Win	529

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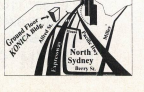
HAND SCANNERS	
Logitech Scanman 256	335
Logitech SMan 256 w OCR	398
Logitech SMan Colour w OCR	810
Caere Typist w OCR	720
PORTABLE SCANNERS A4	
Niscan Portable A4, 400DPI G/S	1154
Niscan Spectra 24bit Colour, 4" x 6"	1040
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24 PIN PRINTERS	
Epson LQ-100, 80col 200cps	462
Epson LQ-570, 80col 192cps	633
Epson LQ-1070 136col 252cps	863
Oki ML-380, 80col 150cps	522
Oki ML-590, 80col 360cps	839
Oki ML-591, 136col 360cps	996
Fujitsu DL-1150, 110col, colour	544
Fujitsu DL-5800, 136col 504cps	2190

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Canon Squirt BJ-20	595
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Canon BJ-200 A4 w autofeeder	655
Canon BJ-230 A3 w autofeeder	799
Canon BJ-300,10" 300cps	1038
Autosheet feeder for BJ-300	164
Canon BJ-330,15" 300cps	1179
Autosheet feeder for BJ-330	214
Canon BJ-600C Colour A4	1440
Canon BJ-800C Colour A4/A3	2470

Sound & Video

SoundBlaster V2.0 Mono w speakers	162
SoundBlaster Pro 2 Stereo	290
Soundblaster 16 bit, Hi-Fi stereo	398
Soundblaster 16 bit, ASP Hi-Fi stereo	467
AudioMaster 16 bit	350
M/Vision Pro-Audio Spectrum Stereo16	356
M/Vision Parallel Port sound adapter	291
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Audio Master Studio Pro Stereo Spkrs	166

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Sony CDU7811 Scsi-2, 280ms, Ext	1095
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NEC CDR-84-1 Scsi, int	748
NEC Scsi I/face kit f 74/84	164

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T1900, 486-SX20, 4M, 200M	3345
T1950, 486-DX2/40, 4M, 120M	3750
T1950, 486-DX2/40, 4M, 200M	4195
T4600, 486-SL33, 4M, 120M	4886
T4600, 486-SL33, 4M, 200M	5339

Toshiba - Colour Notebooks DOS & Win.

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T1900C, 486-SX20, 4M, 200M pas	4611
T1950C, 486-DX2/40, 4M, 120M pas	5008
T1950C, 486-DX2/40, 4M, 200M pas	5410
T1950C, 486-DX2/40, 4M, 120M TFT	6068
T1950C, 486-DX2/40, 4M, 200M TFT	6674
T4600C, 486-SL33, 4M, 120M TFT	7387
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Mitac

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Mitac 486-SLC33, 4M, 120M	2990

Mitac - IntelLCD Notebooks

Mitac 486-SX25, 4M, 120M	3364
Mitac 486-SX25, 4M, 212M	3690

Mitac - Intel Colour Notebooks

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Mitac 486-SX33, 4M, 200M passive	4790
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HP DeskJet 550C inkjet Colour	1498
HP DeskJet 1200C inkjet Colour	2750
HP DeskJet 1200C inkjet Colour P/S	3818

Laser Printers

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HP LaserJet 4P, 600 DPI	1491
Canon LBP4i, 4ppm, 1M	1225
Canon LBP4u, 4ppm, 1M	1239
DataProducts, 8ppm, 1M	2290
Canon LBP8-4, 8ppm, 2M, 2 Bin	2890
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HP LaserJet 4, 8ppm, 2M, 2 Bin	2998
HP LaserJet 4M, 8ppm, 6M, 2 Bin	3998
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Avtek Mega+ modem 1234 300/12/24/96	568
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Netcomm Int/Faxmodem 24, w. MNP-2-5	321
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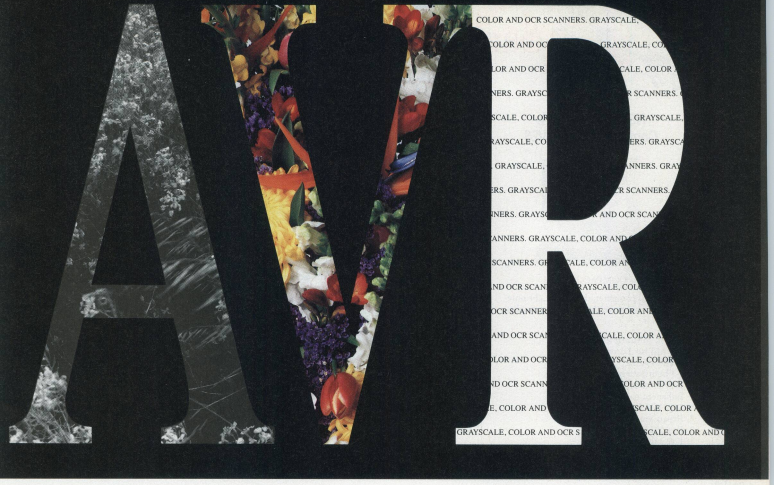
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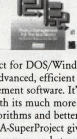
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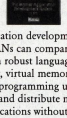
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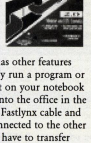
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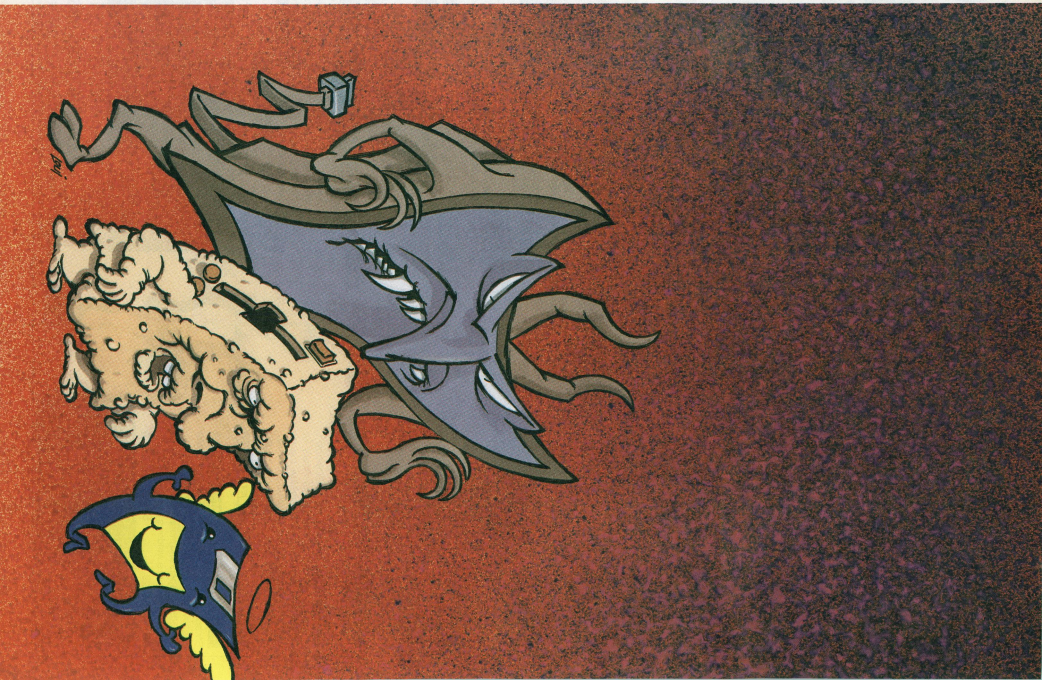
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Illustration by Louis Silvestro



Upgrade or PERISH!

The average buyer spends several hundred dollars on software, at least a couple of thousand on hardware, and countless hours finding out how they work together. When you consider they are also likely to throw most of this investment in time and money away when they need improved equipment and capabilities, you might be right in thinking there is a better way.

Rather than doing the standard thing and consigning the current software and hardware to the attic, you could consider carefully and upgrade. This allows you to keep your computer investment afloat and bolts on more functionality than it already has. So instead of selling everything off very cheaply, or simply replacing the current technology, you can make the most of what you already have, but make it work better with an upgrade.

Making the initial decision to buy software and hardware is often a juggling act. When it comes to upgrading, the waters are often a little more clouded. Jeremy Torr rolls up his sleeves and finds out the good, the bad, and the ugly in the upgrade scene.

Software

If you are thinking about upgrading your software, there are two basic options; same-product upgrade and crossgrade. Same-product upgrades are often given the big advert treatment when a new product is first launched. Like with Ami Pro, Excel, WordPerfect and most of the major products, you can use your original product purchase to offset the price of the latest version. Many offers come in the form of slips in the original box, some require the registration page from the manual or one of the disks as proof of ownership.

The advantages in upgrading like this are numerous. You take delivery of a product you are already fairly familiar with; the file formats usually dovetail in with no conversions required, and above all, you pay less for the latest version. The saving can be as much as 75 per cent off the RRP — a considerable amount. The disadvantages are that you are locking yourself even more securely into one vendors' embrace; that you may upgrade before you need to because of an artificially imposed 'time limit'; and that you may officially lose the rights to use the original software.

Nonetheless, some product software upgrades are a good way to avoid losing the investment in your current software. If you are not an existing registered user you may find some problems upgrading within the product range of a given vendor. This can be a nuisance if you have bought the product secondhand and were not able to transfer the ownership with the program.

The other option is to use your investment in one company's product to make another company feel good about its market penetration: the crossgrade deal. This involves doing the dirty on your customer loyalty scruples and opting for a competitor's product. The competitor will often advertise its new software as being "the best . . . we are so confident . . . so we will give you $200 off. . . just send us proof you have bought a copy of X, Y or Z."

All you have to do is send the vendor a copy of a disk, the manual registration, or in some cases simply say, "Yes, I did buy a copy" to get the crossgrade deal. The advantage here is you may have a really old version, you may have 'lost' the original manuals, or you may not even be the legal owner (heaven forbid). The software companies are well aware of all these tricks, but are still willing to encourage flouting of their own software licensing codes in the pursuit of a new sale — even at the reduced price. Such is the importance of market share.

The disadvantage of the crossgrade can be the need to relearn a program and the possible incompatibility of file formats. Nonetheless, in most cases you are not giving up the right of ownership or use on the original package so you have little to lose apart from the lower price you pay for the crossgrade program.

Upgrade specialists

Kingston Technology	(03) 690 9699
Australasian Memory	(02) 899 5637
ACA Pacific	(02) 953 9536
Intel	008 257 307
Hypertec	(02) 879 6655

Good, bad, and ugly practices (software upgrades)

- GOOD: crossgrades, cross-platform compatibility.
- Guaranteed buy-back offers.
- Money-back guarantees.
- BAD: Time limits on upgrades.
- Old stock clearances with expensive upgrades built in.
- UGLY: Non-transferable warranties.
- Incomplete products with more to pay for what should be essentials.
- Sending back the 5.25in disks for an upgrade then selling the 3.5in software and manuals to your mate.
- Limited period offers allied to low stock levels.

The mechanisms

Most upgrade and crossgrade offers are advertised and dealt with by the publishers themselves. This means you have to deal with a large company, possibly interstate. That large company probably has upgrade and crossgrade offers at the bottom of its list of priorities. There is a distinct possibility of a wait on supply, no chance of popping in to the local shop to give them a roasting if all does not arrive when promised, and possibly some big phone bills to boot.

Having said that, many upgrade and crossgrades go very smoothly, and give all concerned total satisfaction. Some companies allow users to deal direct with retailers and give the participating shop a credit for each exchange deal done. The only disadvantage here is to the retailer. He gets rid of all his stock and puts his cashflow smartly into reverse until next month. Hence this option is not too popular on Main Street so don't complain loudly if your local shop won't take that copy of Windows 2.0 you want to trade up for a version of Chicago.

If you are considering a software upgrade, make contact with the publisher first to check the dates on which the offer is valid. Also check when the next new release is due; a bargain this week may be a defunct dodger next month. And lastly, find out what support is offered. There are instances on record of vendors selling cut-down specials in order to make the market sing.

Other ways . . .

One other semi-upgrade option is the trial disk special. Marketers will target you, either through direct mail or your favourite consumer magazine, and 'give' you an almost working copy of a program they think you may use. Once you have trialled the software, (most often the Save and Print options are disabled) you can send back the disk to the makers for a real version at a discount price. Although not a true upgrade, this method is widely used to tempt users into opting for a particular product.

Hardware

With the increase in direct-buying opportunities, options for upgrading hardware are increasing by the minute. Today, you can slap in a new motherboard, slot in a new CPU, click in a few extra SIMMs and install a CD-ROM drive all without going farther than the phone and the post box.

One of the biggest players, IBM, is now offering to part exchange your old PC for one of its new PS ValuePoint machines as long as your trade-in is old technology. Trade-in prices can range from a little under $300 to nearly $800 for an IBM 286. Some retail stores also run occasional special deals to help rid you of that old home computer (remember when they were called that?) and get more current technology. Check the trade-in discount here though; you might get more by advertising in the window of the local milk bar.

If your old PC is still offering sterling service, you might consider simply boosting it under the bonnet without changing the bodywork. You can hang on to your disk drives, power supply, case, memory, monitor and keyboard, but change the CPU or motherboard. The former option

Before you upgrade

1) Is it worth carrying on with the current software/hardware?
2) Would you be better starting afresh with new technology?
3) Can you save money over a replacement package/unit?
4) What is the future possibility of more upgrades?
5) Would a simple extra package/machine do the same job?
6) Can I sell my current equipment privately for more?
7) Is the upgrade easy to source and maintain?
8) If something doesn't work, what are the alternatives?
9) Is now the right time to upgrade?

only applies if you have one of the proprietary chip upgrade systems such as those from Ipex, Compaq, AST or Acer (for older PCs), or a 486 and above for simple chip swaps.

Intel will sell you a new DX or DX2 processor, along with a special tool to lever the old CPU out of its socket. All you have to do is pop the new one in and power is yours to use. Newer machines with ZIF (zero insertion force) sockets, and those with provision for the Pentium chip are even easier to upgrade — if you can afford it.

Having said that, Cyrix DRx-2 chips are pin-compatible with original 386 CPUs and can in many places simply be swapped for the original Intel chip. Just be sure to check first as some boards use off-chip components, which won't work with more powerful or faster chips.

Obviously if you have a creaky old 286 you will not have this option. The alternative is to source a complete new motherboard from one of the many suppliers advertising in *PC Super Market*. Prices for a quite reasonable 486SX start a little over $400, and you get to keep your hard disk, software and everything as it was.

Make sure all your cards are compatible with the new motherboard, make sure it will fit in the existing case (although a new tower case will also give you more room for the next expansion), and make sure you have enough RAM on board, as the existing RAM modules may not fit in the new scheme of things.

Some companies also offer a complete swap-over service. This entails you delivering your old PC — whatever CPU type — to the upgrade company. They then re-fit all the peripherals into a new case, complete with a new motherboard, and you take away a more powerful machine with all the same characteristics of the old one. These companies also generally offer some kind of warranty, which is useful.

If your current PC is one of those which does not have the right CPU for a straight replacement, or has all the I/O components on board, thus making a motherboard swap impossible, plug-in upgrades may be available. Some speed-up boards from companies such as Hypertec can boost your PC speed by either fitting in a special slot, or using an ISA plug-in card in some cases.

RAM cram

The other easy way to get more out of your PC, especially if you are using Windows, is to fit it with more RAM. This will give more room for your software to move. Before you rush out to spend big on a heap of chips, make sure the new memory is the same speed (marked in nanoseconds or ns) as the old ones as different speed memory modules can get cranky with each other. This can cause operating problems but is easy to avoid.

If you already have plenty of RAM but things are not as rapid as you would like, consider retrofitting faster RAM. 70ns is a good standard; if yours is 100ns or slower, consider swapping it if you can afford it.

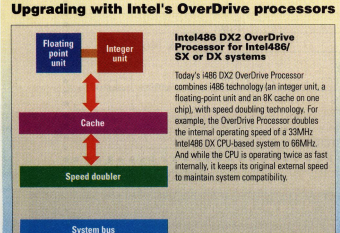
If the CPU is doing its best, but your hard disk or video board is clogging everything up with slow reads and writes, check if you can upgrade the static RAM in those areas. Many new disk controllers come with extra RAM slots on board. Put more SIMMs in there and you will definitely see a speed increase. Likewise your video card; you may need to remove the old chips and replace them with the new ones in this case.

Outgrading

Before you decide to spend your piggy-bank dry on that wonder upgrade, make sure you check the advantages thoroughly. One amazingly simple and cheap option is outgrading, or expanding not the system but your equipment numbers. Simply buy a second software package or a second cheap PC. This will very often give extra power, extra multitasking and extra capability allied to built-in redundancy, complete backward compatibility and a very flexible learning curve.

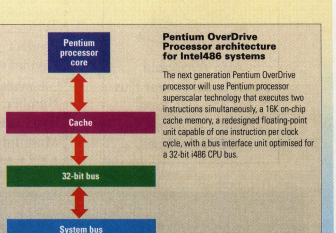
Hey, it worked for me. Pass me my old XT portable with Wordstar 2 on it, someone!

Upgrading with Intel's OverDrive processors



Intel486 DX2 OverDrive Processor for Intel486/ SX or DX systems

Today's i486 DX2 OverDrive Processor combines i486 technology (an integer unit, a floating-point unit and an 8K cache on one chip), with speed doubling technology. For example, the OverDrive Processor doubles the internal operating speed of a 33MHz Intel486 DX CPU-based system to 66MHz. And while the CPU is operating twice as fast internally, it keeps its original external speed to maintain system compatibility.



Pentium OverDrive Processor architecture for Intel486 systems

The next generation Pentium OverDrive processor will use Pentium processor superscalar technology that executes two instructions simultaneously, a 16K on-chip cache memory, a redesigned floating-point unit capable of one instruction per clock cycle, with a bus interface unit optimised for a 32-bit i486 CPU bus.

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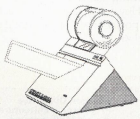
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Edited by – Margaret Coffey, Jeremy Torr and Richard Sharpe

If the first time you think about warranties is the day the machine breaks down, you have made a mistake. The time to think about maintaining your computer is when you buy the machine, not the day the warranty runs out.

On the face of it, the warranty choice is simple. Take the manufacturer's warranty and either extend it or buy cover from an independent third-party maintenance (TPM) company. Many manufacturers use third-party maintenance organisations to provide onsite warranty service, so the latter is a valid option.

If you have a notebook PC, make sure you read the warranty small print. Being compact, lightweight and packed with expensive, undersized, proprietary parts, they are subject to more and different stresses than desktop PCs. They are generally treated to more shocks, and are expected to operate in a much wider variety of conditions. Hence their warranties and service arrangements tend to be different.

What it costs

Including maintenance as standard sounds good, but remember you always pay for maintenance. Companies that include maintenance as standard are sometimes willing to negotiate a lower price if the customer opts out of the deal, so make sure you are not locked into an unsatisfactory or surplus warranty arrangement.

How a direct seller pays for its third-party maintenance can affect your rights if the company goes bust. Just as you might pay an annual fee or pay by the individual call, so can a manufacturer pay to its warranty service provider. How the manufacturer chooses to pay depends on the volume of PCs it sells and the volume of service calls that its PCs demand. Hence you can have a cast-iron, five-year warranty which means zip if the original vendor goes under. Generally, the larger the company, the better the chances of getting continued service. You should also check what compensation the company offers if it can't meet its obligations.

How a direct seller pays for its third-party maintenance can affect your rights if the company goes bust.

Maintaining standards

Buying maintenance direct seems like a logical extension of buying computers direct. However, there are many more variables. These have less to do with price than with the level of service you want and the complexity of the computer system.

Response time is one of the biggest issues. An eight-hour response time sounds impressive, but is that eight hours until the machine is fixed, or until someone returns your phone call? And is eight hours

response fast enough? Some companies offer a four-hour response time in metropolitan areas, but remote rural areas will obviously attract different contract arrangements.

Networks raise yet more issues when considering TPM services. Today's networks often combine equipment from five or six different manufacturers. If you can call one company which is responsible for the whole installation — instead of three or four different vendors — you will definitely get better service. A handful of different service providers are all likely to try to convince you

If you have a good maintenance agreement you will be able to relax to a certain degree on the hardware front.

the problem is with someone else's equipment.

On a network, it's often not obvious whether it's hardware or software that is causing the failure. A company which supports both — and many TPM providers do — has an obvious advantage in those situations, so check before you sign.

It can be important to match the size of your company to the size of the TPM company. It is inevitable that in most cases a small business is going to be given a lower priority by a large TPM organisation than a major corporation. Consider what hours the maintenance company is open for calls, especially if your business keeps non-standard hours.

If your business is in retail and your peak times are evenings and weekends, a service hotline which is only open from 9am to 5:30pm Monday to Friday is not going to be there when you need it most. Inquire into the financial standing of the maintenance company and make sure it will be there to fulfil the contract when you want it. Check out the company's background: you need to be confident that it will survive to the end of the contract period. And satisfy yourself it is qualified to work on your equipment to the manufacturer's standards.

Ask how long it would take to get frequently replaced or upgraded parts. If the company can't say, that's not a good omen.

It used to be cheaper to use a TPM than to extend the manufacturer's warranty, but fierce competition has changed this. However, even if you're convinced you want to stay with the manufacturer, maintenance has become so competitive that it can be worth putting the business out to tender anyway. Apart from the price advantage, doing so can force you to analyse exactly what your installation needs.

But what happens if...?

If you have a good maintenance agreement you will be able to relax to a certain degree on the hardware front. To make sure you're not caught out by burglary, floods, fire, or an aggrieved employee, you'll need a full insurance policy. The PC insurance market is not a high-profile one, and companies selling these policies have only just begun marketing them to direct buyers.

Most insurance companies will have a policy to suit you, and they can be contacted through any of the major companies, although you might feel more comfortable with a specialist who is likely to have a more comprehensive knowledge. Some user groups offer PC insurance policies, and vendors are starting to offer them bundled with the price.

TPM suppliers



■ Honeywell	(02) 353 7000
■ Ferntree	008 816 633
■ Digital	008 252 277
■ Wang	(02) 898 6433
■ NCR	(02) 964 8111
■ GUICare	008 813 294
■ Miden Pacific	(03) 321 0000
■ Bull Information Systems	(02) 847 7100
■ HelpKey	008 634 357

Basically there are two types of PC insurance:
I) Additional risks insurance, which covers everything outside a typical maintenance contract.
2) Computer breakdown/-maintenance insurance, which covers all aspects of maintenance, usually including accidental and malicious damage, and a resulting increased cost of carrying on the business.

Warranty checklist



- It may be easier to have one TPM provider for all your hardware and software. Check if the company you are considering can support everything including networks.
- Is the TPM provider qualified to work on your equipment? Is it approved by the manufacturer?
- What is the standard response time and charge for a repair back to operational condition?
- How will you be charged: annually or per call? Are there other options and what are the premiums for faster response times?
- What happens if your equipment changes during the maintenance period? Will the contract cover this?
- What compensation is offered if the TPM provider defaults on the contracted obligations?
- Does the TPM provider offer temporary replacement equipment if required? This could be vital in some situations but check if there is an extra charge for this.
- What hours is the TPM open to receive calls and to carry out site visits?
- Check the size and geographical distribution of the TPM provider as to whether it suits the requirements of your installation(s).
- How long has the TPM provider been in operation? Visit the company if possible and ask for reference sites.

Data recovery is often included in both of these policies, although it can cost more and sometimes requires a separate policy. A typical additional risks policy will cover any unforeseen accidental damage, malicious damage, impact, fire, flood, theft and certain types of breakdown which are not covered by a maintenance contract.

Business interruption, and the increased cost of working (such as passing the work onto a bureau or getting temps in), are also usually covered. Extras may include software replacement or salvage, debris removal, automatic cover for new equipment, extra computer rental costs, cover for the equipment while it is overseas, and any accountant's fees which may be charged for calculating a claim.

Make sure if you have any particular requirements — such as online transaction processing (OLTP) of customers — you can claim for lost business as well as recovery expenses, although this will obviously boost the premium and attract certain equipment clauses too.

Cover from your policies

When completing any proposal, you must specify exactly all the equipment you want covered and check the insurers or TPM providers will cover it all. If you want to include portables on the policy, check they are covered offsite.

Don't automatically assume your policy will cover any claim and be aware of exclusions. This can apply to war risks, damage caused by radiation, sonic booms from aircraft travelling at sonic or supersonic speeds, communications failures caused by deliberate disconnection, industrial action, use of non-approved equipment, cost of routine maintenance, or programming errors and utility failure as a result of emergency measures. And obviously unauthorised poking inside the works will void any agreement in double-quick time.

Some policies also exclude general wear and tear. Watch out for this one as it can often be hard to define exactly what wear and tear is, especially on the more technical equipment.

Insurance companies have the advantage over TPM companies because they do not have the same costs of warehousing spare parts, paying overheads or acquiring special- ist tools and equipment.

This means they can offer prices which are far cheaper than many TPM companies, manufacturer maintenance products and warranties. The disadvantage is you can only call them in after something has gone really wrong. Plus the time taken to rectify the problem will also be generally greater.

The cost of a manufacturer's maintenance is usually between eight and 15 per cent of the retail price, but it can be up to as much as 40 per cent. TPM companies try to undercut the manufacturer, and can often be considerably cheaper for the same stated cover. With insurance, the cost is usually around five per cent of the retail price and can be even cheaper if the percentage is worked out on the cheapest equipment replacement value.

Look out for a new breed of maintenance contracts and extended warranties in which the contracts or warranties themselves are insured.

Look out for a new breed of maintenance contracts and extended warranties in which the contracts or warranties themselves are insured. This means if the company goes bust or the warranty work exceeds the premium, an insurance company can continue the contract with another TPM provider.

Most insurers promise immediate response to almost any fault, with little or no administrative burden on the insured. Of course, the reality is unlikely to be as rosy as the picture painted by a salesperson, but the quality of service of maintenance insurance policies is generally high. Despite this, TPM companies hold the lions share in a competitive market, with insurance companies' maintenance insurance still to secure a big market share.

Insurance contacts



FAI	131 000
SIO/GIO	131 010
Royal Insurance	(02) 978 9000
NZI Insurance	(02) 551 5000
Mercantile Mutual	(02) 234 8111
Commercial Union	(02) 963 4700
AMP	(02) 257 5000
Manchester Unity	(02) 284 1200
Alexander & Alexander Ltd (Brokers)	(02) 283 3100

Checking your policies



- Are you happy with your existing TPM company or warranty in terms of service, spares availability and response, and does the price compare to insurance?
- Have you had to pay out any extra money this year because you were not insured? Make sure **everything** is covered.
- Are you covered for accidents, fire, theft, flooding, software faults and data loss? Does your existing office contents policy adequately cover the value of your equipment?
- Have you considered or insured the cost of disaster recovery for both data and equipment?
- Are your portables covered for all the places you may wish to use them, including abroad and in public places?
- What are the policy cancellation terms?
- If you need to increase or change the cover, will this cause a big price hike?
- Get at least three independent quotes. Do not accept the first policy shown to you.

Don't judge a computer by its looks.

It's the components inside that matter.



So, you are buying a new computer, or perhaps you are upgrading your current one. There are a few ways to go about it. You can buy a brand name that you know and pay the price for it, or you can buy a cheap one. And that's exactly what you will get - a cheap computer.

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386 DX/40 4MB RAM, 130MB HDD 14" SVGA Colour Monitor **$1,650.00**	486 DX/50, VESA LocalBUS 8MB RAM, 210MB HDD SONY 14" SVGA Monitor **$3,680.00**	PEARL 486DX NoteBook 4MB RAM, 120MB HDD COLOUR LCD Screen **$4,600.00**
486 DLC/33 4MB RAM, 130MB HDD 14" SVGA Colour Monitor **$1,750.00**	486 DX/2 66, VESA LB 8MB RAM, 340MB HDD NEC Multisync 17" Monitor **$5,340.00**	NEC Ultralite VERSA NB 4MB RAM, 120MB HDD Active Matrix Colour **$6,700.00**

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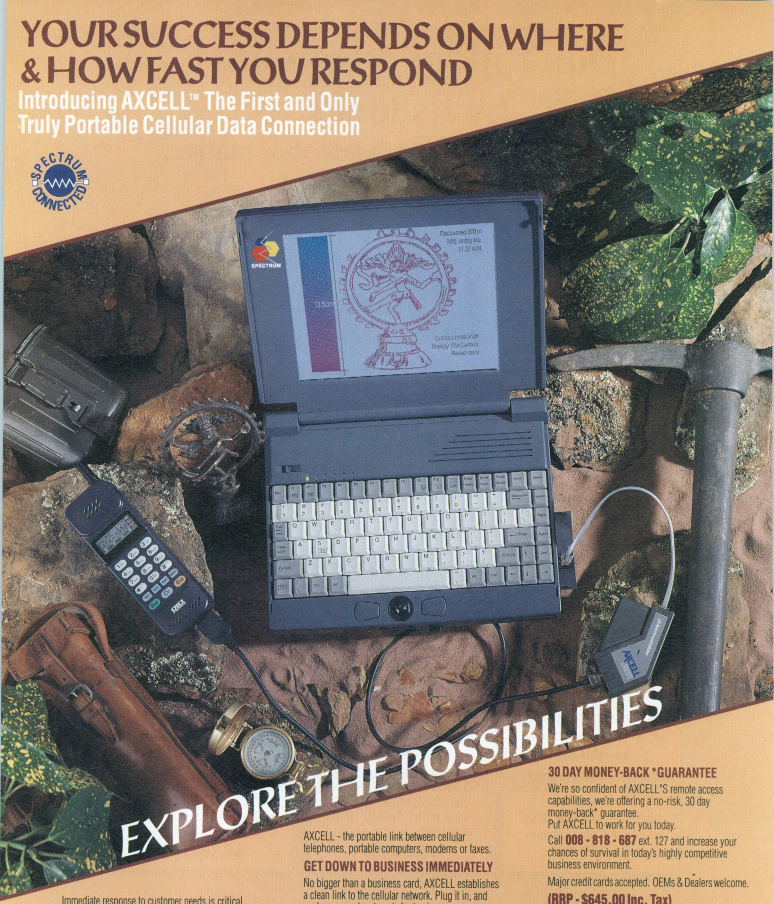
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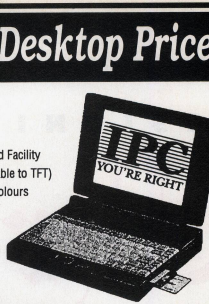
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DESIGNING YOUR OWN

Christmas cards

Having trouble justifying a PC purchase for Christmas? PC Super Market looks at some computing gifts and how they may be put to practical use during the Christmas season.

BY HELEN DANCER

When *PC Super Market* dreamed up the idea of a feature which described a home project to suit the season — designing your own Christmas cards — your faithful scribe must confess to thinking, hah! this will be a snap. But getting into the exercise quickly reminded me why it is I chose to write for a living — me and art don't mix.

Fortunately, there are some fabulous offerings for even the most bumbling Breuhgels and pitiful Picassos among us, in terms of snappy PCs, low-priced colour printers, and dead easy artwork and publishing software. Let the kids loose to see what they can come up with, then put them to bed early and have a go yourself!

The PC we used for the project is one of the new Dell NetPlex range. It comes with a built-in CD-ROM, 4M RAM and a 170M hard drive. The NetPlex is featured in the *PC Super Market* charts detailing PCs under $3000. Included in the Dell package is Windows 3.1 and one of four CD packs, each containing six CDs focusing either on education/recreational use, or a home office. The NetPlex's 486/25 processor is most efficient at running the CDs, giving the lie to the often proposed misconception that it requires a heavy-duty machine to run CD-ROM.

The printer is a HP DeskJet 550C, which offers colour inkjet printing at roughly the same cost as black-and-white laser printing, and I have to confess it is heaps of fun to use. It replaced TV for a while as the home entertainment medium of choice at our place as we mixed and matched colours, and tried to pick faults in the machine's ability to render on paper the colours we saw on the screen. In nearly all cases we couldn't fault it, and the jury is still out on whether the variations we did spot were actual differences, or the failing light. The colour DeskJet carries a price tag of $1447, while its monochrome DeskJet sibling retails for $723. If the budget doesn't stretch to colour printing, a nice alternative is to design clean line drawings or simple Christmas images and print them on a recycled coloured or tinted paper. Matching paper and envelopes are available from specialty shops such as The Ink Group, or the stationery departments of larger stores such as Myer, David Jones and KMart.

The people from Hewlett-Packard recommend special paper to run in the DeskJet printers, one matt and one glossy. However it will, in theory, take papers from 60 to 135gsm, and is quite amenable to the papers we tried. Herbal-schmerbal recycled papers which are very felt-like in texture suffer more bleed (absorption of the ink around the designated line) and the results are a bit messy. The best idea is to buy a couple of sheets of the paper of choice and run them through your printer

— whatever kind it is — before investing in a Christmas stock of any larger quantity. A4 sizes only for this printer too, which means you can even get two cards to every page.

Once you have the machinery organised, there are a plethora of design packages from which to choose.

The most obvious and inexpensive option is to draw your own Christmas designs with Paintbrush, which is a standard offering inside Windows. Paintbrush offers spray cans, paintbrushes, paintrollers, lines and shapes, and a great assortment of colours, but no built-in intuition or talent! So for the artistically challenged, (aka, myself) companies like New Horizons and TDA Help! come to the rescue. New Horizons is based in Armidale in NSW, and was originally an educational software provider. That is why the packages provided by the company were originally designed for the Mac, but most are now available in DOS/Windows formats as well. The Down Under Collection is New Horizons' mainstay product, offering a vast range of images of Australian life, culture and history, as well as seasonal and topical icons. The package costs $249.95 as a DOS/Windows version, and



Capture images from many sources and create your own ideal card

purchase of the software allows for unlimited non-commercial use of the images provided. In commercial use, the company requires that source credit be given where more than 20 images from the collection are used in any publication, and that no more than 50 images be used in any one publication.

Importing images from the Down Under Collection into Paintbrush or any other presentation graphics software such as Freelance Graphics, is a fairly simple matter. This allows you to play with the images, colour them and combine one or more images with your own handiwork — draw a Christmas tree and add a New Horizons dove on the top, for instance, or repeat images across the page. Paintbrush and Freelance won't save the image, however, only the changes that have been made to it, and users will find that they can't get access to the clip art unless the diskette is in the floppy drive.



Simple styles for black and white or colour printing

This failure to save the image to the hard drive was originally misconstrued as a sophisticated copyright measure, but conversations with New Horizons reassured us that in fact it is simply an undocumented feature (known in the trade as a 'bug').

It's a bug that doesn't in any way affect the performance of the software, however, and it's lots of fun to experiment.

Not just for Christmas either, this package has images of ANZAC, Gough, Billy McMahon, and masses of Australian native animals, and is a wonderful education resource.

TDA Help! imports two Christmas packs from Simple Simon Says — the most relevant being a swag of Christmas Clip Art. Angels, santas, trees, doves and wisemen galore, ready to be imported, as before, into Paintbrush, making even this grudging Gauguin into a candidate for a job at Hallmark.

At $29.95, the Simple Simon people would probably get upset if they found their software being used for commercial purposes, but for home Christmas greetings, it represents good value for money.

By far the most sophisticated package we tried is The Print Shop Deluxe and Print Shop Deluxe Companion. The packages, produced by Broderbund, are distributed in Australia by Dataflow, and carry a retail price of $139.95 and $89.95 respectively for the Windows versions. This indulgent software delight hand-holds even the most inarticulate in the process of creating not only cards, but posters, letterheads, certificates, envelope designs and business cards. It provides image libraries covering all manner of celebration and seasonal festivity.

It first establishes what kind of format is required and then prompts the user to choose a style, background, and a series of images and headline alternatives. Greetings can be in banners, upward or downward arcs, or graded colours across the page or card.

The tricky part of the software is that it designs front, back and inside of the card on a single sheet of paper, so that when it is printed out, it is necessary to fold each and seal the ends, then fold in the middle so that it resembles a standard greeting card. This means simply that you have to bear this in mind when choosing a paper, as the finished product is going to be double thickness.

The most obvious and inexpensive option is to draw your own Christmas designs with Paintbrush.

All in all, if buying a PC for the kids for Christmas seems like a sensible, parental, or just a good fun thing to do, there are plenty of sound alternatives to choose from, and more than just games to keep them (and you!) occupied once it is all plugged in. ✍

Suppliers

Dell	008 808 312
Hewlett-Packard	131 347
New Horizons	(067) 711 055
TDA Help!	(02) 417 6047
Dataflow	(02) 310 2020

Price Watch

Buying computer equipment for Christmas? The Price Watch team looks at what specials you can expect from distributors during the festive season.

Buying a PC for the kids (or even for a 'significant other') at Christmas, is no less fraught with options, trade-offs and pseudo bargains than buying a PC at any other time of the year.

Price Watch examines a range of options in both hardware and software on which to base the weighty decision of a PC for Christmas. Low-priced, high-performance 486s represent, if not the standard, certainly the best price performance trade-off for a home PC. CD-ROMs are also an increasingly common component in the home PC architecture.

Of the 486 PC choices under $2000, the most notable aspect is the more-for-your-money emphasis. Prices have fallen slightly in real terms since the last time Price Watch investigated 486s, but value for money has increased dramatically. The early availability of Pentium PCs and increased competition from higher profile vendors such as Compaq at this price point are obviously taking their effect. Only one of the models offered less than a 100M hard drive, and the median is closer to 170M than the previously recorded average of around 140M. Another lure is a faster processor type. Many of the models we surveyed under $2000 offered 33MHz or higher, though the most common type was 25MHz, and a higher performance VESA bus.

The market is also offering masses of multimedia-capable PCs for under $3000, in stark contrast to the situation in August, when Price Watch's investigation of the rising phenomenon of the demand for CD-ROM drives in PCs uncovered only two models at under $3000. This investigation demonstrates that in just under four months prices have dropped significantly (although bear in mind that these also include Christmas specials — prices may revert after January to higher relative levels) but configuration and bundle details remain much the same. 4M RAM, high-capacity hard drives, longer warranties and CD bundles all reinforce that the customer is not getting demonstrably less for spending less.

Software is another dimension — how does a parent define the balance of educational, entertainment and recreational software, and split the budget accordingly? The good news is, there are plenty of packages emerging which do both. CD-ROM has fostered a new category — edutainment software, that is a better synthesis of learning and fun. To address the question 'Now that I've got a CD-ROM drive what do I do with it?', most of the multimedia-capable PCs we collected in the tables, bundle CD software as part of the deal.

These packages are also a good balance between fun and learning, typically offering Microsoft Bookshelf, Encyclopaedia, Carmen San Diego, Microsoft Works, Jones in the Fast Lane and so on. Dell's NetPlex multimedia-capable PC bundle offers a choice of one of four packages of CDs, for the home-office buyer, recreational use, education or a blend of both.

The software tables that begin on page 56 are a selection of both disk-based and CD-based offerings which meet the definition of edutainment.

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NEW! **3037/8 AS-EASY-AS** Ver 5.5 Latest version. Popular easy-to-use Spreadsheet with heaps of features (2 disks).

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NEW! **1884/5/6 PC-FILE** 5.0 A Flexible Easy to use database program, Unbeatable Value. Extremely Powerful. Heaps of Features. Popular Shareware Program (3 Disks).

1341 FORMGEN II Create/Fill out and Print any kind of form for business or personal. Great for: Order Forms, Invoices, Credit Notes Etc..

2503/4 BIZZ PACK Aussie designed Easy to use program for Invoicing, track income/expenses and running a Business. Great for Sub-Contractors and Tradesmen (2 Disks)

1371/2/3/4 GRAPHICS LIBRARIES Graphics for Printmaster, Printshop, First Publisher, Wordperfect etc. Windows 3 Over 1000 graphics on almost any topic; includes conversion and printing utilities (Printmaster Powered / 1st Publisher). (4 Disks).

1375 ADULT GRAPHICS X-Rated graphics.

NEW! **2987/8 ENVISION PUBLISHER** Latest version. Shareware version of Aust/world DTP GUI, WYSIWYG, mouse, scalable fonts, more! One of the best we've seen. (2 Disks)

1893 GRAPHIC WORKSHOP Menu driven program for converting graphics between the most popular graphic formats. Super features. (Converts PCX, GIF, TIFF, WPG, MSP,BMP)

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1078/1838 PIANOMAN Turn your computer into an electric piano, includes heaps of tunes. Save/ Record/Edit songs. Fully full featured (amazing) Program, Easy to use. (5 Disks)

NEW! **3066 PC-VALU-1+** Ultimate security for your PC. Password protect your PC

NEW! **2290 F-PROT** Easy to use, Menu driven ANTI-VIRUS program Powerful & accurate: Scans Deletes viruses.

1552 POINT & SHOOT HOME MANAGER Outstanding comprehensive Home Management System. Budgeting, Inventory, Vehicles, Names, Addresses, Finances, Calender.

2079 SCHOOL MOM The best Children's Educational Software around! Has it all. Math, Music, Art, English Spelling, Time and Games.

NEW! **3167 RESCUE ROVER** Super arcade style game with great EGA/VGA graphics. Help save Rover!

2990/3 MATH RESCUE Exciting Arcade style game - Age Approx (5,8,12) (3 disk)

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NEW! **3055 ACTION GRAPHICS DataBase** For "EnctorSet" concept, Build-animate objects.

NEW! **3110 TREASURE HUNT MATHS** Great EGA/ VGA arcade style game for ages 5-12

2497/8 ASC TALK & 123-TALK A great quality **Talking** human voice lesson for kids 1- 7. Teaches counting, numbers, alphabet, words.(2 disks).

2569/7 ALGEBRA TUTORS 4 programs. Teaches Algebra, Linear equations, story problems (2 Disks)

NEW! **2910 ADVENTURE MATH** For 5-10 yr olds

2635/6 ANIMATOR Create animated Pictures making program for kids, with real human digitised sound. **(SOUNDBLASTER/A). (2DISKS)**

1886 SKYGLOBE Most Popular! Super Astronomy Program. View the stars and sky in revolving colour. Entertaining and Educational.

1337 TUTOR DOS Excellent tutorial on DOS and Computers for the NEW computer User

1081 PC-KEYPRESS Great Touch type Tutor. Disc plays Colour image of keyboard

1001 LANGUAGES Teaches French, Spanish, German Italian .Files are compressed.

1745 EDUCATALK Easy to use World Map

NEW! **3102 VOCABULATOR** Learn 11 languages. Plays a flipchart display of basic words.

1277 CROSSWORD CREATOR Easy to use Crossword creator & designer

2345 JUMPJET High flying, Shootem down arcade game. Great graphics, fast moving game

1891/2 FORD CAR SIMULATOR II Test drive & Race various Ford Cars. Great fun. (2 Disks)

1930 SCRABBLE Try your skills and Vocabulary, with the Computer watching you. 2 Games

1424 GET LUCKY Adult Games

2363 PAGANITZU Outstanding adventure into the mysterious AZTEC caves. Great Graphics

1365 CHESS,MONOPOLY,REVERSI

NEW! **3072 CASINO GAMES** Great graphics of BlackJack, Poker & more!

2533 CD-MAN The Best PAC-Man type game

2364 CRYSTAL CAVES Adventure into the different levels of these amazing caves.

NEW! **3039/4 CATACOMB ABYSS** Unbelievable EGA graphics and action, similar to Wolfenstein (**5.25" 3 - disks, 3.5" - 2 disk**)

2209 DUKE NUKEM Incredible 3D Graphics effects and large animated characters.

2151 COMMANDER KEEN One of the Best Quality EGA/VGA Available.

2413/4 COMMANDER KEEN (4) (2 Disks) Goodbye Galaxy. Arcade adventure Game.

2080 COMMANDER KEEN IN "KEEN DREAMS" Help overcome Nightmare Possibilities

NEW! **2603/4 WOLFENSTEIN 3D** Latest Ver. It's the Best Games with the Most Action VGA graphics (**5.25" x 2 Disks, 3.5" x 1 disk**)

2900 DESIGNWORDSEY Great graphics fly around with your JetPack, blast Aliens (Hi Density Disk drive required)

1101 PICTURE PUZZLE Super Jig Saw Puzzles

NEW! **2291/2 KILOBLASTER** 256 Colour VGA Shoot-em-up Game. Great graphics!

NEW! **2304 I SPY METAL** New 256 Colour VGA game - Great Cold Metallic scenery.

NEW!! **2706 STARFIRE** Outstanding Aussie arcade game.

2686 JILL OF THE JUNGLE Outstanding game, great sound effects

2696 DOSCOMMAND 1/2/3/4 Audio Librarian for CD's, Cassettes, LP's.

1435 MONOCLOCK Lets you Run Programs reading CGA on MONO System. 1 Program/Utility per Diskette.

2771 DESERT FROG SCREEN SCENES One of the best Screen savers around. It's almost like seeing a slide show.

2801/2 POWER MENU Version 6 - Outstanding Menu System. (**2 disks**)

2500 TALK VOICE (LIBRARY) Add super quality Sound to Batch files, Menus and DOS commands: Say Hello, Welcome etc

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DISK-BASED EDUTAINMENT SOFTWARE

Product name	Distributor	Age group	Description	Price
Peter Pan	Electronic Arts (075) 91 1388	6 to 10 years	Includes a set of animated paint tools which allow children to control the events in the stories that they read. It includes over 30 scenes and over 250 possible choices	$70*
Video Jam	Electonic Arts (075) 91 1388	8 years and upward	Allows users to create videos and play animations set to their favourite music. It features more than 50 musical works from rock music to Bach	$70*
Scooter's Magic Castle	Electronic Arts (075) 91 1388	5 to 8 years	Includes more than 20 learning games and activities. Each activity reinforces a skill such as matching, counting, colours, patterns, keyboarding and creativity	$80*
Ping and Kooky's Cuckoo Zoo	Electronic Arts (075 91 1388	3 to 6 years	Features three adjustable skill levels and five different activity areas with multiple games in each. The program takes the user through a guided tour of a zoo where you meet the animals	$70*
Eagle Eye Mysteries	Electronic Arts (075) 91 1388	8 to 14 years	Simulating a detective agency, this program allows the user to interview suspects and hunt for clues, strengthening their deductive reasoning skills	$70*
Where in Space is Carmen Sandiego?	Dataflow Computer Services (02) 310 2020	10 years to adult	A detective game where you try to track the thief, Carmen Sandiego, as she travels the universe. It includes digitised NASA images of the sun, moon, planets and stars	$99.95

KEY

N/S Not specified

* Electronic Arts does not provide recommended retail prices. The price quoted is an approximate retail pricing.

DISK-BASED EDUTAINMENT SOFTWARE

Product name	Distributor	Age group	Description	Price
The Playroom	Dataflow Computer Services (02) 310 2020	2 to 6 years	The program teaches children the basics including reading skills, counting, letter recognition, telling time and spelling	$84.95 (MS-DOS), $89.95 (Mac)
The Treehouse	Dataflow Computer Services (02) 310 2020	2 to 7 years	By observing from the treetops, this program provides specific language, music, maths and science skills encouraging creativity and curiosity	$89.95 (MS-DOS), $89.95 (Mac)
DinoPark Tycoon	Dataflow Computer Services (02) 310 2020	9 to adult	Allows the user to build and operate their own amusement park. The aim is to select and purchase the right exhibits and make the right business decisions	$79.95
Prince of Persia 2 - The Shadow and the Flame	Dataflow Computer Services (02) 310 2020	10 to adult	A entertainment program	$99.95
Easy Sim (Windows)	Edsoft (03) 878 4899	N/S	A logic simulator which allows the user to design and simulate electronic circuits and observe and learn digital electronics	$59.95
PC Logo Version 4	Edsoft (03) 878 4899	N/S	The new version of Logo has more than 300 built-in commands. It supports mouse, colour and music and teaches programming skills through creating complex drawings	$189.95
Interactive Physics for Windows	Edsoft (03) 878 4899	N/S	Simulates a motion laboratory where the user can set up vector displays and other measurement tables	$545

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DISK-BASED EDUTAINMENT SOFTWARE

Product name	Distributor	Age group	Description	Price
A Maths Assistant	Edsoft (03) 878 4899	N/S	Intelligently applies the rules of algebra, trigonometry, calculus and matrix algebra to solve mathematical problems and display results graphically	$350
Science Adventure	Light Years Ahead (02) 477 6666	5 years to adult	Guides the user through the worlds of chemistry, biology, physics, ecology, technology, maths and astronomy	$149
Knowledge Adventure	Light Years Ahead (02) 477 6666	5 years to adult	Explores the worlds of art	science
The Down Under Collection	New Horizons (067) 71 1055	All ages	A library of hand-drawn Australian line art. The graphics cover a variety of subjects in 58 categories with a total of 1500 images	$249.95
True Blue Graphics Volume 1 — Australiana, Volume 2 — Education	New Horizons (067) 71 1055	All ages	Subsets of the Down Under Collection described above	$89.95
Swamp Cartoon Creator	New Horizons (067) 71 1055	All ages	Based on the Swamp cartoon character, allows the user to create their own cartoons. Contains over 300 characters	props
Barromore Pastoral Company	New Horizons (067) 71 1055	12 years to adult	An agricultural simulation which allows the user to manage a property in a realistic environment	$95.00

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- 6 Independent 16 bit counters.
  - Part No. 17014 $145.00

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- 59 keys.
- Clear removable key caps to allow custom legends.
- All keys reprogrammable.
- New configuration is down loaded from PC and stored in EEPROM.
  - Part No. 8190 $282.00

Industrial Control Membrane Keyboard
- Standard PC compatible keyboard.
- Free standing or rackmounting.
  - Part No. 17012 $514.00

Loopback Plug Set
- Consists of one DB9 female, one DB25 female and one DB25 male loop back plugs.
- Designed to test serial and parallel ports with programs such as Norton Utilities 7.
  - Part No. 15023 $25.00

Parallel Data Transfer Cable
- Allows data transfer between computers via parallel ports.
- Can be used with programs such as DOS 6 Interlink, Laplink or Norton Commander 4.
  - Part No. 9044 $30.00

Bubble Jet Refill Kits
- Kits includes two refills.
- Twice the ink for half the cost of a single cartridge.
- Suitable for Canon BJ 10e, ex, sx, Apple Style Writer, Star SJ-48 and Brother HJ-100i.
  - Part No. 5140 $25.0

16550 UART with FIFO's
- Essential if you want to operate modems at 9600 baud & above.
- A direct replacement for the 16450 and 8250 in character mode.
- Includes 16 byte buffers on transmit and receive in FIFO mode.
  - Part No. 8127 $31.00

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- Novell WNIM+ compatible adapter.
- 8 RS232 asynchronous ports.
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- 80186 CPU for high performance.
  - Part No. 2207 $1244.00

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- Onboard CPU
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- 10MB/S fast SCSI-II transfer rate.
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  - Part No. 2201 $499.00

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- Take advantage of our 16 bit cards which provide interrupts from IRQ2 to IRQ15.
- One card with four serial ports and either one or two parallel ports.
  - Part No. 2097 4 serial, 1 parallel $157.00
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- Provides 8 I/O Ports
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    - Part No. 17005 $257.00

Video Grabber
- Freeze live video images & save as BMP, PCX, TIFF file.
- Resizeable image window.
- Operates under Windows 3.1
- Three software selectable video sources.
  - Part No. 3103 $549.00

Broadcast Quality VGA to Video
- Display your computer VGA output on a TV or record on a VCR.
- Ideal for training rooms etc.
  - Part No. 3068 $1178.00

TV Tuner Card
- Provides Video and Audio signals as source for Monitor TV Card, Video Grabber Card, Sound Card etc.
- Channel selection software runs under DOS and Windows.
  - Part No. 3092 $177.00

VGA Splitters
- Operate multiple VGA monitors from one computer.
- Each monitor may be up to 75m from splitter.
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  - Part No. 3070 2 Way $237.00
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Bar Code Reader
- The latest technology has allowed the decoder to be integrated into the body of this bar code reader.
- A simple in-line plug/socket connects the bar code reader between the keyboard and the computer.
  - Part No. 8193 Barcode Wand Keyboard wedge $445.00

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- Provides 4 or 8 RS232 ports multiplexed onto 6 core telephone cable.
- A demultiplexer box with 4 or 8 DB25 connectors may be located up to 500m from the computer.
  - Part No. 2205 4 Port Multiplexer Card & Box **$466.00**
  - Part No. 2206 8 Port Multiplexer Card & Box **$549.00**

Diagnostic Cards
- Find motherboard problems *FAST.*
- The POST error code is displayed on a LED display.
  - Part No. 3018 Made in Taiwan $152.00
- LED's indicate BUS voltage levels.
- Includes Logic Probe.
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  - Part No. 8095 $131.00

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  - Part No. 3017 Single burner to 1M $348.00
  - Part No. 3038 Four burner to 1M $479.00
  - Part No. 3003 Eight burner to 1M $675.00
  - Part No. 3057 Single burner Serial to 512K $298.00
  - Part No. 3058 Single burner Serial to 4M $468.00
  - Part No. 3079 Single burner to 2M H/Spd $453.00
  - Part No. 3080 Single burner to 8M H/Spd $730.00
  - Part No. 3087 Four burner to 8M H/Spd $690.00
  - Part No. 3088 Eight burner to 8M H/Spd $1360.00

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CD-ROM BASED EDUTAINMENT SOFTWARE

Product name	Distributor	Age group	Description	Price
Scary Poems for Rotten Kids	Captain CD ROM (03) 859 9554	7 years and up	An interactive story book with word pronounciations, meanings, music and sound effects. Assists children with reading skills	$59.95
Oxford English Reference Library	Captain CD ROM (03) 859 9554	All ages	A complete English reference. It includes the Oxford English Dictionary, Oxford Thesaurus, Oxford Dictionary of Quotations, the complete works of Shakespeare, the Oxford Guide to English Usage, the revised English Bible and Alice in Wonderland	$268
Wing Commander 1 and 2 + Speech	Captain CD ROM (03) 859 9554	N/S	An action adventure game. It includes Wing Commander II, Special Operations 1 and 2 and the Wing Commander II Speech Accessory Pack	$99
Mayo Clinic Family Health Book	Captain CD ROM (03) 859 9554	Adult	Includes 90 minutes of audio, 45 animated illustrations, 500 colour illustrations and full text search of 1300 pages. Computer physiological processes are presented in detail and explained in an interactive format	$69
The Captain's Treasure Chest	Captain CD ROM (03) 859 9554	Adult	Includes the Clipart Goliath — over 11,000 clip art images; America's Premiere Shareware 1993 — over 1G of useful shareware programs covering communications, games, utilities, education and fonts; and the Australian Phone Disk which is the complete Australian Business and Residential Phone Directories	$98

KEY

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CD-ROM BASED EDUTAINMENT SOFTWARE

Product name	Distributor	Age group	Description	Price
Peter Pan	Electronic Arts (075) 91 1388	6 to 10 years	Includes a set of animated paint tools which allow children to control the events in the stories they read. It includes over 30 scenes and over 250 possible choices	$90*
Scooter's Magic Castle	Electronic Arts (075) 91 1388	5 to 8 years	Includes more than 20 learning games and activities. Each activity reinforces a skill such as matching, counting, colours, patterns, keyboarding and creativity	$80*
Whales and Whale Watching	Dataflow Computer Services (02) 310 2020	All ages	An Australian publication providing an overview of whales that are seen in Australian waters and whale behaviour in general	$99.95
The Tortoise and the Hare	Dataflow Computer Services (02) 310 2020	6 to 12 years	One of Broderbund's Living Books is based on a fable by Aesop. Allows children to choose between having the text read aloud to them or exploring each page on their own	$89.95
The New Kid on the Block	Dataflow Computer Services (02) 310 2020	6 to 12 years	Allows children to browse through the children's poems written by Jack Prelutsky	$99.95
Myst	Dataflow Computer Services (02) 310 2020	14 years to adult	A surrealist game of adventure and betrayal. It includes a haunting soundtrack, puzzles and 3D graphics	$129.95

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CD-ROM BASED EDUTAINMENT SOFTWARE

Product name	Distributor	Age group	Description	Price
Aesopolis	Dataflow Computer Services (02) 310 2020	6 to 12 years	Aesop's Fables on CD-ROM. Features artificial intelligence, virtual reality, an interactive dictionary and self-paced learning	$139.95
Pinocchio	Light Years Ahead (02) 477 6666	4 years to adult	An adaption of the original classic with sound effects and spot animation	$119
Annabel's Dream of Ancient Egypt	Light Years Ahead (02) 477 6666	5 years to adult	Introduces Annabel the cat. It includes 50 minutes of CD audio, narration and music and provides instructional vocabulary, games and comprehension exercises about Ancient Egypt	$159
Annabel's Dream of Medieval England	Light Years Ahead (02) 477 6666	5 years to adult	Features audio narration and music, games and comprehension activities combined with interesting facts about England	$159
The Animals Encyclopedia	Light Years Ahead (02) 477 6666	6 years to adult	An interactive adventure in the animal kingdom providing facts, photographs and sounds of animals in their natural environment	$169
Compton's Interactive Encyclopedia	Light Years Ahead (02) 477 6666	6 years to adult	Provides an interactive means of accessing the 26 volumes of Compton's Encyclopedia. It features multiple paths to accessing information which consists of full text, video clips, pictures, animations, world atlas, sounds and music	$795

KEY

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486-BASED PCS UNDER $2000

Name	Distributor	Manufacturer	Processor	CPU speed (MHz)	Bus type	Standard RAM on motherboard (M)	Maximum RAM on motherboard (M)	Monitor in configuration	Hard disk (M) in configuration	Number of expansion slots	Bundled items	Warranty	Recommended retail price of configuration
Alpha 486SX/25	New Concept Technology (03) 388 0087	New Concept Technology	SX	25	VESA	4	32	SVGA	210	3V	None	12 months	$2000
AMS 4250LX	Multisource (02) 955 8100	Alaris	SLC2	50	ISA	4	16	SVGA	125	3[16]	D5.0	3 years	$1960
AVO 486SX/33	AVO Electronic Systems (02) 906 2655	AVO Electronic Systems	SX	33	ISA	4	32	SVGA	130	4[16], 1[8]	D6.0	12 months	$1995
Baseline 486SX/25 VL Bus	Peninsula Peripherals (03) 776 6423	Peninsula Peripherals	SX	25	VESA	4	32	SVGA	250	2V, 4[16]	Mouse	2 years	$1985
Compro Eclipse 486-2x VESA	KCM Direct (03) 429 2733	KCM	SX	25	VESA	4	64	SVGA	170	3V, 6[16], 2[8]	Mouse	5 years	$1990
Club MBX Intel 486SX/25	Multisource (02) 955 8100	CLUB American Computers	SX	25	ISA	4	64	SVGA	85	6[16]	D5.0	2 years	$1999
Diamond 486SX/25	Morse Peripherals (02) 821 1814	Morse	SX	25	ISA	4	32	SVGA	100	4	D6.0, [W]3.1	12 months	$1999
Fox 486DLC/33	All Data (03) 794 5799	All Data	DLC	33	ISA	4	32	SVGA	120	2[16], 2[8]	D6.0, Windows	12 months	$1999
GA486S-25	G & A Computer Technology (02) 718 1160	G & A Computer Technology	SX	25	ISA	4	32	SVGA	245	3[16], 2V	N/S	12 months	$1825
IPS 486SX/25i	Intelligent Printing Systems (02) 906 7855	Intelligent Printing Systems	SX	25	ISA	4	32	SVGA	210	6[16], 1[8]	D6.0	12 months	$1995
Memdex 486DLC/33	Memdex Computer Systems (070) 31 1577	Memdex	DLC	33	ISA	4	32	SVGA	170	3	D6.0, Memdex menu pack, mouse, two free airline tickets to Singapore	12 months	$1995
Neli Intel 486SX/25 ISA/VISA	Neli Computers (02) 417 5355	Neli Technologies	SX	25	ISA, VESA	4	32	SVGA	130	4I, 3V	Keyboard dust cover	5 years labour, 12 months parts	$1950
Peripherals Plus 486DX/40 VL	Peripherals Plus (02) 630 3166	Peripherals Plus	DX	40	VESA	4	32	SVGA	130	3V, 5[16]	Mouse	2 years	$1975
Sprinter 486SX/25 VESA	Optima Computer Technology (02) 638 1222	Optima Computer	486SX	25	VESA	4	32	SVGA	105	1[8], 3[16], 1[32]	None	2 years	$1750

KEY

Number of expansion slots [8] — 8 bit, [16] — 16 bit, [32] — 32 bit

Bundled items D — MS-DOS, [W] — Windows

MULTIMEDIA PCS UNDER $3000

Name	Distributor	CPU	CPU speed(MHz)	Standard RAM on motherboard (M)	Maximum RAM on motherboard (M)	Hard disk (M) in configuration	CD-ROM	Sound card	Speakers	Bundled title or other items	Warranty	Price (including tax)
Alpha 486SX/33 M	New Concept Technology (03) 388 0087	486SX	33	4	32	210	Sony CDU 3104	Sound Blaster Pro	Sound Blaster	N/S	12 months	$2950
Archcom 486SX/25 MM	Archcom (02) 558 9288	486SX	25	4	32	130	Panasonic CR-563	Sound Blaster Pro 2	Sound Blaster	Multimedia Encyclopedia, MS-Bookshelf, Corel Artshow, Creative Sounds, Creative Sampler, Great Cities of the World	2 years	$2878
Austin 486SX MM	Hartland (02) 313 4133	486SX	33	4	32	170	Sony CDU 3104	Sound Blaster Pro 2	Zela	Chessmaster 3000, World Atlas, US Atlas, Mavis Beacon Touch Type, Encyclopedia	12 months	$2999
AVO 486DLC/33 MM	AVO Electronic Systems (02) 906 2655	486SX	33	4	32	130	Creative Lab double speed	Sound Blaster Pro 2 Stereo	Creative Lab	MS-Bookshelf Encyclopedia, Creative Sound, Introduction to Nautilus	12 months	$2980
Compro Eclipse 486-SX VESA MM	KCM Direct (03) 429 2733	486SX	25	4	64	170	Panasonic CR-562	Supra 16	Compro	MS-Bookshelf or Works, Compton's Multimedia Encyclopedia, Willy Beamish, King's Quest 6, Return to Zork, 7th Quest	12 months	$2980
Club MBX 486SX/25 Multimedia	Multisource (02) 955 8100	486SX	25	4	64	125	Sony CDU 3104	Zoltrix	Zoltrix	Pack of 9 CD-ROMs included	2 years	$2980
Epoch Multimedia	Harris Computer Superstore (02) 957 1142	486SX	25	4	32	85	Panasonic CR-562	Sound Galaxy 16-bit	Laser Station	World Atlas, USA Atlas, Mavis Beacon Teaches Typing, Chessmaster 3000	2 years	$2990

KEY

N/S Not specified

MULTIMEDIA PCS UNDER $3000

Name	Distributor	CPU	CPU speed(MHz)	Standard RAM on motherboard (M)	Maximum RAM on motherboard (M)	Hard disk (M) in configuration	CD-ROM	Sound card	Speakers	Bundled title or other items	Warranty	Price (including tax)
Express 386DX MM	Express Solutions (02) 281 1255	386DX	40	4	32	130	Panasonic CR-522	Sound Galaxy Pro	N/S	N/S	12 months	$2220
Fox 486DLC/33 MM	All Data (03) 794 5799	486DLC	33	4	32	120	Panasonic CR-563	Sound Blaster	Creative Labs	Toolworks Encyclopedia, Animals in the San Diego Zoo, Just Grandma and Me, Carmen San Diego	12 months	$2998
GA486D/33 MM	G & A Computer Technology (02) 718 1160	486DX	33	4	32	245	Panasonic CR-562B	Sound Galaxy NX Pro	Sound Galaxy	N/S	12 months	$2850
GA486S/25 MM	G & A Computer Technology (02) 718 1160	486SX	25	4	32	245	Panasonic CR-562B	Sound Galaxy NX-Pro	Sound Galaxy	N/S	12 months	$2450
IPS 486DX/33I (M16)	Intelligent Printing Systems (02) 906 7855	486DX	33	4	32	210	Panasonic CR-522	Sound Galaxy NX Pro-16	Screen Beat	Pack of 2 CD-ROMs included	12 months	$2995
IPS 486SX/26 (M16)	Intelligent Printing Systems (02) 906 7855	486SX	25	4	32	210	Panasonic CR-562	Sound Galaxy NX Pro-16	ScreenBeat	Pack of 6 CDs	12 months	$2775
IPS 486SX/33I (M16)	Intelligent Printing Systems (02) 906 7855	486SX	33	4	32	210	Panasonic CR-562	Sound Galaxy NX Pro-16	ScreenBeat	Pack of 6 CDs	12 months	$2845
Memdex 486SX/33 MM	Memdex Computer Systems (070) 31 1577	486SX	33	4	32	245	Panasonic CD-562	Sound Galaxy NX Pro-16	Sound Galaxy	2 airline tickets to Singapore or Fiji	12 months	$2995

KEY
N/S Not specified

MULTIMEDIA PCS UNDER $3000

Name	Distributor	CPU	CPU speed(MHz)	Standard RAM on motherboard (M)	Maximum RAM on motherboard (M)	Hard disk (M) in configuration	CD-ROM	Sound card	Speakers	Bundled title or other items	Warranty	Price (including tax)
Neli Intel 486SX/25 ISA/VESA Multimedia	Neli Computers (02) 417 5355	486SX	25	4	32	130	Panasonic CR-522	Sound Galaxy 16 bit	Compro	Chessmaster 3000, Mavis Beacon Teaches Typing, US Atlas 3.0, World Atlas 3.2, Toolworks Encyclopedia	12 months	$2895
Netplex	Dell Computer (008) 80 8312	486SX	25	4	32	170	Panasonic CR-563	Sound Blaster 16	Labtec	Choice of 4 packs of 6 CDs	12 months onsite	$2895
Osborne 486SX/25 MM	Osborne (008) 80 8312	486SX	25	4	32	170	Panasonic CR-563	Sound Blaster Pro	Osborne	N/S	12 months onsite	$2989
Peripherals Plus 486DX/40 VL MM	Peripherals Plus (02) 630 3166	AMD 486DX	40	8	32	214	Panasonic CR-563	Sound Blaster Pro 16	Screen Beat	Shakespeare, Mammals	2 years	$2875
PPL 486 MM	Peninsula Peripherals Langwarrin (03) 776 6423	DX	33	4	64	120	Panasonic CR-562	Laserwave 16	Screen Beat	None specified	12 months	$2995
Sprinter 486SX/25 VESA MM	Optima Computer Technology (02) 638 1222	486SX	25	42	32	105	Panasonic	Sound Blaster Pro 2	Creative Labs	Toolworks Encyclopedia, The Animals, Carman San Diego Deluxe, Grandma & Me	2 years	$2550
TP 486SX/25 VESA MM	Total Peripherals (02) 417 7455	486SX	25	4	32	210	Panasonic CR-522B	NX Pro	Sound Galaxy	MS-Bookshelf, World Atlas, Macromedia Action V2.0, Guinness Disk of Records, SGMPC Sampler, Spirit of Excalibur, Space Quest II, Jones in the Fast Lane, Arthur's Teacher Trouble, Loom	3 years	$3000

KEY

N/S Not specified

Reminiscing

BY STEPHEN WITHERS

It's been a long time since communications first started. We've certainly come a long way . . .

This issue marks the tenth anniversary of the 'Communications' column. Actually, the original name was 'Network News', but that's clearly when the series started. To set the scene, advertisements in the December 1983 issue of *APC* were full of CP/M systems, Apple II lookalikes, Commodore 64s and VIC 20s. A few upmarket dealers were advertising the IBM PC and early almost-compatibles ($6000 for a twin-floppy system!). Most of the brand and company names are now long forgotten, although there are some survivors.

The BBS listings contained three numbers each in Sydney and Melbourne, and one in rural Victoria. Considering the price of computers in those days, and the fact that Australia's first BBS only went online about 18 months earlier, that doesn't seem too bad a start. To pad things out we also listed eight systems in North America, half a dozen in the UK and another four in continental Europe. The online pioneers were generally running at 300bps. Users were just as likely to be using an acoustic coupler instead of a direct-connect modem, and not all BBSs had hard disks.

During 1984, it became apparent that the industry was moving to 16-bit processing power. MS-DOS systems became increasingly common, and the Macintosh made its debut. These computers were still well out of the price range of most home users, and a variety of more or less proprietary systems were popular: names like Oric, Spectrum and MicroBee were commonplace. In some ways, prices then were pretty similar to those today: a low-end modem for around $200 — it's just that today's model is eight times faster.

'Network News' listed new BBSs in Perth, Adelaide, Darwin, Newcastle and Brisbane. However, the numbers were still fairly small (28 by the end of the year), and we also provided listings for South Africa and New Zealand, as well as the other countries previously mentioned.

Some BBS developers started thinking about the way people used bulletin boards, and began investigating different metaphors. One of the earliest programs to get away from the idea of a noticeboard was Citadel, which used the idea of rooms in a building to structure a BBS. Remote CP/M systems went beyond the idea of a bulletin board and allowed users to run a variety of programs as well as reading and posting messages and transferring files.

Things snowballed in 1985, with 80 systems in our list by the end of the year. Fido BBS software came to our attention, but the network of BBSs that we now take for granted was only embryonic.

As hardware became cheaper, the user base expanded. In some ways this was a good thing, but antisocial behaviour became apparent. 'Network News' mentioned such vices as downloading files that were incompatible with the user's system. Sysops began to implement access controls to limit the activities of those who weren't contributing to the upkeep or maintenance of the board, or simply to keep people out until they had been vetted. Another effect of increased usage was that some sysops started planning to introduce multiline systems. 1985 was also the year that saw this column change its name to 'Communications'.

During 1986, the format of our listings changed to isolate updates from new listings. It was no longer possible to print a complete list every month as there were 100 Australian BBSs online, so the full listings only appeared twice a year. In July, 123 systems covered every state and territory, and overseas listings were a thing of the past.

Developments in BBS use included multiplayer games written specifically to run on bulletin boards, 1200bps modems cheap enough to encourage many users to move up from 300bps, and a dozen or so nodes on the Australian FidoNet.

Out in the rest of the personal computing world, CD-ROM was "poised on the edge of enormous growth," laptops were something like the systems we know today (the Toshiba 3100 seems a little large, and $8000 for a 286-based machine with a 10M disk appears pricey, even with a plasma display).

The spectre of timed local calls raised its head in 1987, and Telecom announced that data calls would be timed from mid-1988 (which didn't happen). The carrier added to its unpopularity by deciding that BBSs were examples of "third-party switching," needing its approval before they went into operation, and that they were "business services" and therefore the business rental would apply (again, subsequently dropped).

Many sysops switched their allegiance from Fido to Opus, a newer program that still provided support for FidoNet networking (FidoNet had grown to about 2000 nodes around the world). The Zmodem protocol, more efficient than its predecessors, was taking off, and a 9600bps modem appeared on an Australian BBS for the first time. Such modems were too expensive for most of us, but 2400bps had become affordable. Around 180 boards were listed in the July issue. By now, there was no question that IBM-compatibles were the mainstream of personal computing, although the Macintosh was clearly the second standard and the Amiga had its devotees.

By 1988, *APC* was pretty much the magazine you know today; that is, it had become an MS-DOS and OS/2 journal. Modem prices were as low as $400 for 2400bps, over 260 BBSs were online, and a dispute over rules resulted in the creation of a locally-based alternative to FidoNet. The year ended with *APC*'s 100th issue, a

monster edition so fat it had to be bound in two parts. Appropriately, 'Communications' took a look at Australia's oldest continuously-running BBS, Peter Jetson's Micom CBBS.

By 1989, 9600bps modems were beginning to get an airing, but at $2100 they hadn't broken into the mainstream. In terms of content, the BBS scene had settled into its current format: the mass market had taken over from the pioneers.

Lloyd Borrett started what was believed to be Australia's first true multiuser BBS. PC Connection's new format featured multiplayer online games, a CD-ROM drive, shopping by modem and other features. It also led the way with time-based charges. Rodney Creer took on the task of managing the Australian BBS Registry, and in April we listed nearly 300 systems. That was the last time we presented a full listing: since then it has featured new systems and updates only.

The number of boards might have grown by 1990, but the number of users had increased even faster. Engaged tones were heard more frequently, but a partial solution was the use of an offline mailer, allowing users to dial into a BBS, quickly download waiting messages, read them and compose any replies or new messages while offline, and then reconnect to upload them. The client/server model was beginning to reach BBSs. By the spring, Spider Island Software had released TeleFinder, a Macintosh program that was probably the first true client/server BBS.

File sizes were increasing as well as the number of messages, so it was probably good that 9600bps modems were falling towards the $1000 level. The 486 arrived, initially in $20,000 systems. Prices were down around $10,000 to $15,000 by the end of the year, but that was still about 50 per cent higher than 386 models — maybe Pentium PCs aren't so expensive after all! Laptops became small and light enough to fit inside a briefcase, Windows finally took off, it became apparent that we would get a second phone company, and the first FidoCon Oz! conference was held.

By 1991, it was clear that Windows was on a roll, and the 386 had become the basic business PC. The idea of cross-platform applications (that is, Windows and Macintosh versions with essentially the same look and feel) was taking hold. Pen computers started to appear, continuing the emphasis on the user interface. The first V.32bis (14,400bps) modems went on sale at around $3000, and Australian TeleFinder systems began operation. *APC* decided to end the duplication of effort, and instead of exchanging information with the Australian BBS Registry we began to publish the registry's listings. PC Connection grew to 12 lines, and experimented with international chat sessions. Fax modems became commonplace in 1992 with prices as low as $300. High-speed comms was beoming affordable again as V.32bis prices dropped rapidly below $700 (have you noticed the way the goalposts keep moving?).

In addition to the BBS-specific networks such as FidoNet, increasing numbers of boards were connecting to Internet, multiplying the number of topics available to readers. We mentioned one board carrying about 1300 conferences. And so to 1993, this year's modems provide voice and fax forwarding as well as the traditional fax and data capabilities, and manufacturers are preparing for the introduction of 28,800bps models (we'll probably be able to afford them by 1995). The introduction of the Pentium pushed the 486 from its performance perch, but at $20,000 rather than $3000, not that many 486 owners were crying about it.

FirstClass has joined TeleFinder in the GUI BBS arena, and offers Windows client software. Remote Imaging Protocol (RIP) allows more traditional BBS packages to support graphics and a GUI; Wildcat! was one of the first to support this protocol.

We've also seen the arrival of Apple's Newton MessagePad and other handheld devices that seem destined to alter the way we communicate.

Within a decade, the number of bulletin boards in Australia has grown from seven to over 900. At least one has gone the distance without a change of name or sysop: the pioneering Micom system — Peter Jetson, take a bow.

Submissions

The information in this column is provided by the Australian BBS Registry. It is presented in good faith but *APC* cannot take responsibility for its accuracy. New information and updates should be sent to the Registry Co-ordinator in your state.

You can also post BBS List news onto the EchoMail conference, BBS_NEWS, which is available nationally as a public area. Netmail BBS List enquiries to Rodney Creer at 3:713/317. Postal registrations to PO Box 731, Penrith NSW 2751.

National Rodney Creer, Australian BBS Registry, (047) 35 6789, FidoNet: 3:713/317, PO Box 731, Penrith NSW 2751

NSW Greg Kuhnert, #1 BBS, (02) 544 7123, FidoNet: 3:712/513

Vic Richard Stocks, The Offline BBS, (03) 808 4510, FidoNet: 3:633/374

ACT Craig Gibson, Caught in the ACT BBS, (06) 292 8288, FidoNet: 3:620/252

Qld James Collins, The Galaxy GateWay Computer System, (07) 812 0727, FidoNet: 3:640/230

SA Grayham Smith, Oracle PC-Network, (08) 234 0791, FidoNet: 3:800/804

WA Graeme Platt, 1990 Multiline, (09) 370 3333, FidoNet: 3:690/254

Tas Roy Austen, Tassie DataBank, (003) 44 9762, FidoNet: 3:670/301

NT Tom Koltai, Kakadu Konnection, (089) 48 0068, FidoNet: 3:850/111

New Systems

NSW

Basecom BBS (02) 671 6149. P. Bill Langfield. V.22bis, V.32, V.32bis. 24 hours.

CosmoComp BBS (02) 621 7315. P. Mark Laurence. V.22bis, V.32, V.32bis. FidoNet 3:713/815. 24 hours.

Darren's Domain (02) 626 5565. MV. Darren French. V.22bis, V.32, V.32bis. FidoNet 3:713/816. 24 hours.

Destinations Unknown (02) 922 3624. MV. Robin Prousheger. V.21, V.22, V.22bis, V.32, V.32bis. FidoNet 3:711/459. midnight-7am daily.

Games Unlimited II...BBS (02) 524 1833. MV. Zoran Ananijev. V.22bis, V.32, V.32bis. FidoNet 3:712/507. 24 hours.

Micromania (02) 560 0811. MV. Marco Nussbaumer. V.22, V.22bis, V.32, V.32bis. 6pm-7am weekdays, 24 hours weekends.

No-Limits BBS (02) 792 1497. P. Adam Sutcliffe. V.22bis, V.32. 8pm-8am daily.

Oasis BBS (02) 832 1537. P. Justin. V.21, V.22, V.22bis. 11pm-6am daily.

Solaris BBS (02) 693 5989. P. Mark Bouza. V.21, V.22, V.22bis. 24 hours.

The Sydney Public BBS (02) 344 6168. P. David Robinson. V.21, V.22, V.22bis, V.23. 24 hours.

Anything Goes (066) 45 2839. M. Steve Teece. V.21, V.22, V.22bis, V.23, V.32. 9:30pm-4:30am weekends.

Bedrock (065) 82 4011. M. Rusty Nails. V.21, V.22, V.22bis. 24 hours.

Down South BBS (042) 62 2236. P. Greg Hodges. V.21, V.22, V.22bis. 24 hours.

Far West BBS (080) 88 4685. P. Allan Meredith. V.21, V.22, V.22bis, V.32, V.32bis. 24 hours.

Krikkit One (049) 42 3565. Matt McLeod. V.21, V.22, V.22bis, V.23. Internet krikkit1.apana.org.au. 11pm-7am daily.

Modem Addiction BBS (065) 41 1808. P. Barry Smith. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 9pm-7am daily.

Piros (067) 67 9256. MV. Ian Timbs. V.22, V.22bis, V.23, V.32, V.32bis. FidoNet 3:622/670. 24 hours.

VIVA! BBS (043) 23 3982 Multi-Line. MV. Ross Briggs. V.21, V.22, V.22bis, V.23, V.32, V.32bis. FidoNet 3:711/441. 24 hours.

Vic

Amiga Valley BBS (03) 458 4729. P. Bob Mcaulay. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

Awesomes Revenge BBS (03) 432 1056. P.

John Ornsby. V.22bis, V.32, V.32bis. 9pm-7am daily.

Data Guardians BBS (03) 419 2595. P. Graham Paul. V.21, V.22, V.22bis. FidoNet 3:633/264. 24 hours.

Empire of Darkness (03) 763 2717. P. Lucifer. V.22bis, V.32, V.32bis, HST. 24 hours.

Flashpoint BBS (03) 521 9883. M. Robert Butterworth. V.21, V.22, V.22bis, V.23. midnight-6am daily.

FRS Shareware (03) 879 9160. MV. Roger Stafford. V.21, V.22, V.22bis, V.32, V.32bis. FidoNet 3:635/540. 24 hours.

MAXUS BBS (03) 531 7860. MV. Joe Fernandez. V.21, V.22, V.22bis, V.32, V.32bis. 24 hours.

Metric Malfunctions (03) 305 5905. P. Robert Rain. V.22bis, V.32, V.32bis. FidoNet 3:632/371. 24 hours.

Neptune II BBS (03) 720 4672. P. Tony Frank. V.22, V.22bis, V.32, V.32bis. FidoNet 3:632/552. 24 hours.

North West Amiga (03) 337 3428. P. Andrew Morison. V.22, V.22bis. FidoNet 3:633/265. 24 hours.

Pato's BBS (03) 367 2924. P. Mark Paterson. V.22bis, V.32. FidoNet 3:635/739. 10pm-6:30am daily.

Sea Of Software BBS (03) 704 7779. P. Dazza. V.21, V.22, V.22bis. 9:30pm-8am daily.

Sound Unlimited (03) 432 0518. P. Chris Noye. V.22bis, V.32, V.32bis. 24 hours.

ThunderBolt BBS (03) 562 5726. MV. Worzil. V.22bis, V.23, V.32, V.32bis. 24 hours.

Warrior's Den (03) 587 4270. P. Stephen Seawright. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

7th Emulation BBS (051) 76 1925. P. Benjamin Kane. V.21, V.22, V.22bis, V.23, V.32. FidoNet 3:632/327. 24 hours.

Alien Dreams (059) 68 6043. P. Shane Barnett. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

ACT

Rapture BBS (06) 257 3660. MV. Alex Colquitt. V.22, V.22bis, V.32. FidoNet 3:620/241. 24 hours.

The Public BBS (06) 239 6308. P. David Robinson. V.21, V.22, V.22bis. 24 hours.

Qld

Sunshine BBS (07) 290 3505. MV. Greg Thomas. V.22, V.22bis, V.32bis. 24 hours.

TAFE Power BBS (07) 878 9393. P. Shane Lim. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

Edge BBS (071) 23 4941. P. Simon Scriven. V.21, V.22, V.22bis, V.23, V.32, V.32bis. FidoNet 3:640/382.4. 24 hours.

Lucky the Cat's BBS (079) 72 7433. P. Steve Watts. V.22, V.22bis, V.32, V.32bis. FidoNet 3:640/521.17. 24 hours.

Sunshine Coast Multiline BBS (074) 44 1477. M. Tom Nitzschner. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

The Quickening (076) 91 0363. P. Pat Gould. V.21, V.22, V.22bis, V.23. FidoNet 3:640/450.5. 24 hours.

SA

ByteBLITZ! BBS (08) 379 6604. P. Justin Viiret. V.22, V.22bis, V.32, V.32bis. FidoNet 3:800/839.5. 24 hours.

Sawasdi BBS (08) 261 7802. P. Philip Thornton. V.21, V.22, V.22bis, V.23, V.32, V.32bis. FidoNet 3:800/846. 24 hours.

WA

Ballistics BBS (09) 276 5267. P. Tony Clark Farid Yazid. V.22, V.32bis. 24 hours.

Hurricane BBS (099) 261 208. MV. Eddy Taylor. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 4pm-11pm daily.

New Systems is compiled every month by Rodney Creer.



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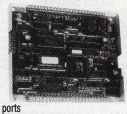
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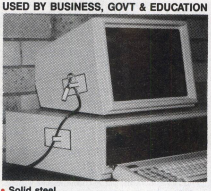
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This month as the bells are tolling and the snow is falling (what?) Chip Chat reveals the secret to debts over the Christmas break, recommends a couple of stocking stuffers, and reveals how to get a celebrity to answer your phone while you're recovering from Christmas fever . . .

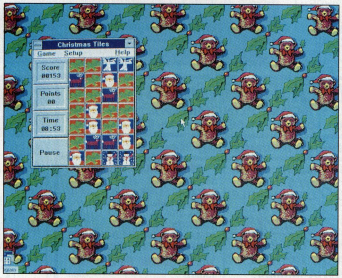
BY CHIP CHAT

If you're wondering how you're going to pay for the excesses you're about to commit over the next month or so, don't bother considering this option. Police are reportedly rounding up new owners of Canon CLC10 colour scanner/copier/printer machines, in search for the clues to a spate of forgeries. It is alleged that the machine is being used to print near-perfect $100 notes which have been widely distributed in Victoria.

It's supposedly not feasible to print on both sides of the paper with the CLC10, but some clever Christmas elf with an eye for the main chance has surmounted the apparent restriction, happily using Canon's superior technology as a licence to print money — sorry, but with a storyline like that, what can you expect?.



Putting aside all endeavours towards editorial objectivity, Chip Chat can heartily recommend a cute Christmas stocking stuffer called Christmas for Windows 93. Produced by



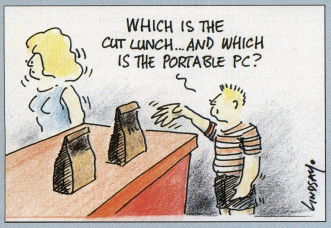
Simple Simon Says in the US, the program is distributed in Australia by TDA Help! ((02) 418 6047). Christmas for Windows 93 contains a whole bunch of Christmassy screen savers and Windows wallpaper, not to mention digital renditions of lots of your favourite Christmas Carols — a sound card is required to make the most of this little gem. It will also facilitate the sending of an electronic Christmas card based on a screen saver, or print out customisable Christmas greetings note paper, and adds two Christmassy fonts to the font directories of any other commonly recognised word processing, spreadsheet or presentation graphics applications installed on the hard disk at the time.

Another Christmas cutie is a collection of ClipArt from the same developer and distributor. Available for Windows or Mac formats, the clip art offers a range of black-and-white and colour images. Each of these packages will carry a RRP of $29.95. Enough with the promo — call the distributors to find out more!



Talking of cute ideas coming from America, Chip Chat waited with anticipation to receive its reviewer copy of the screensaver collection Otis and Bill previewed in last month's issue. We were saddened and disappointed to learn, however, that the good ship Delrina had hit the rocks of intellectual property debate, and had been forced to withdraw the product for further modification. Berkeley Systems prevailed in court over its allegations that Delrina was infringing copyright, rather than, as it claimed, merely using the ideas of local cartoonist, Berkeley Breathed, to spoof the industry. The revised screen saver still features Otis the penguin taking potshots, but his toaster targets are no longer winged. Instead they are borne aloft by little helicopter rotors, and bear the word CENSORED (see picture). Watch this space for updates on the continuing saga, and for news on the software's availability in Australia.

Max, the no-compromises notebook



Max the minitower is redefining the term, portability, at least in the mind of our own Stuart Bowman, product reviewer and Wangophobe extraordinaire.

Max is a 486DX/33 which Stu says fits neatly under his arm — and he should know, because Max the minitower goes everywhere with him.

"We usually travel by public transport — trains are fine, but people give us funny looks on buses. Max loves to ride the ferry, as long as he can sit up the front. He sits up front to get a better view — if we sit inside, he can't see over the railings."

Max also goes on camping trips, and enjoys toasting his cables in front of glowing campfire embers, thanks to a inverter run off car batteries.

When not communing with nature, Max uses more technologically advanced means to commune with his two best friends, Joan, the 486SX/33 and Gengis, another 486DX/33. Both Max and Gengis have built-in modems, so can spend time chatting on the phone when the buses are on strike or the front seats on the ferry are full up. And what sort of high-speed information is passed between them on low-speed lines? Back off, says Stuart, everybody deserves privacy y'know.

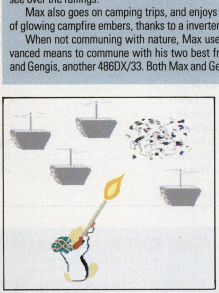
So is Stuart really sure that Max, at just over 8kg, represents the ultimate in portability? "Max is a perfectly good notebook thank you very much!" Stuart resorted later in the day to wilder extremes of language, defending Max's right to be included in the November *APC* review of notebook computers. When his fellow reviewers were adamant that Max did not qualify, he is alleged to have replied, "* * * * * the lottaya. Max is a better notebook than you'll ever be."

"He's certainly a lot lighter than the one I had before," Stuart later told Chip Chat, in a calmer frame of mind. "That was Tyrone the 386; he now lives at Richmond and doesn't do so much travelling any more." Tyrone? Short for Tyrone-osaurus Rex of course, because in his day he was a real monster. Max, says Stuart, is easily carried. "You just hook your hands under the casing, like this . . ." And what about a full-colour display? "Well, I concede it's true," said Stuart, "Max can't support active-matrix colour on the road, but at a pinch you can fit a decent 14in monitor under your left arm, and most places you go these days you can thump some bastard not making adequate use of his monitor and use that until he comes around.

"Admittedly, flying can be a bit of a problem, but increasingly the movie screens on airlines have VGA inputs, and most people don't mind watching me playing Windows Solitaire in preference to the inflight movie."

When *APC* pressed the question of Max's heavier-than-average weight for a portable computer, Stuart again resorted to extravagances of expression, levelling accusations of wimphood and ownership of autographed photographs of Bill Gates against those who preferred 3kg models. "Now Max, he's got a nice poster of Arnie," he snarled. "If Arnie used a notebook, he'd use Max."

And why Max? Maximum throughput and maximum portability! (Stupid question, really.)



In the not-exactly-PC department, another stocking stuffer which passed across Chip Chat's desk this past week is a cassette of answering machine alternatives. Instead of your own dulcet tones on not-at-home-right-now duty you can now have your phone answered by an eminent person with no trousers, a little Johnny making his 900th run up for the opposition leadership (he'll see if he can get Bronny to call you back), or an ex-president feeling vague about which button to push . . . All manipulations of the voice of Keith Scott, the tape is available through Dick Smith Electronics and other such salubrious suppliers.

The following redefinitions of architecture drawn from the metaphor of aeroplane travel, come to us courtesy of Timon Fliervoet, Timonf@earth-.ruu.nl, Institute of Earth Sciences, Department of Geology, Utrecht University, P.O. Box 80.021 3508 TA Utrecht, the Netherlands, and via Martin Stoermer, from the University of Queensland. Martin, a confirmed and dedicated Mac/techie, is unlikely, astounding as it may seem, to be reading this august publication, but just in case, Martin, thanks.

DOS: everybody pushes it until it glides, jumps on, and lets it coast until it skids . . . then jumps off, pushes, jumps back on . . .

DOS w/QEMM: same as DOS but with more leg room to push.

MAC: all the flight attendants, captains, baggage handlers, look the same, act the same and talk the same. Every time you ask questions about details, you are told you don't need to know, don't want to know, and everything will be done for you without knowing, so just shut up.

OS/2: to get on board you have to have your ticket stamped 10 different times by standing in 10 different lines; then you have to fill out a form that states how you want your seating arrangement to be — whether it should have the look and feel of an ocean liner, a passenger train, or a bus. If you are successful in getting on board and getting off the ground you have a wonderful, enjoyable trip . . . except for times when the rudder and flaps freeze stuck, in which case you have time to say your prayers and get your personal things in order before you crash.

Windows: nice, colourful airport terminal, friendly flight attendants, easy access to a plane, uneventful take-off . . . then BOOM! you blow up without any warning whatsoever.

NT: everyone sits on the runway and forms the outline of a plane, then they just sit there and go "PHHLLZZZSST" like they're flying.

Unix: everyone brings one piece of the plane with them when they come to the airport. Then they go out on the runway and piece it together, all the time arguing about what kind of plane they are building.

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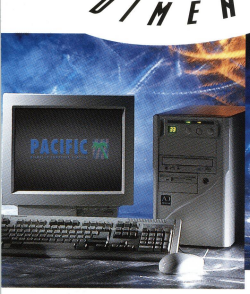
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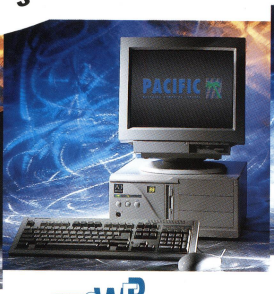
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